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THE CANADIAN MINING JOURNAL

L. 33 TORONTO No. 1

HERE'S ANOTHER LETTER

MUSSENS LIMITED,
MONTREAL, QUE.

Que.,
November 4th, 1911.

Gentlemen:—

[COPY]

It gives me great pleasure in saying that I consider the **Holman Steel Rock Drill** is in my opinion the best Rock Drill on the market.

I have used practically every make of Drill known in Canada and the United States, and find from the standpoint of Maintenance and Efficiency, none work out as well as the Holman.

I have, at this property, four 3¼ inch Holman Drills, two of which were bought in July, 1910, and two in January, 1911. The maintenance costs have been very low; the renewals or repairs to Cylinders, Pistons and Cradles, over the whole period have been nil. I find the power consumed in proportion to the work performed is moderate, and on ordinary pressures, the drilling speed is satisfactory.

I find your Drills most suitable for all round mining work, whether driving, stoping, sinking or raising.

You may make whatever use you like of this letter, as in my opinion, any mine which installs Holman Drills will benefit by the change.

(Name of Company and Name of Engineer furnished on application.)

Yours very truly,

Superintendent Engineer.

We could fill pages of reading matter regarding records made by the Holman Steel Rock Drill: we could tell you that it is THIRTY or FORTY years ago since the first Holman Drill was turned out: we could say you buy drilling experience when purchasing Holman Drills for Holman Bros. are Drill Users as well as Drill makers, BUT WHAT'S THE USE for RESULTS ARE WHAT COUNT and we can show results.

WRITE NEAREST OFFICE FOR CAT. J38.

MUSSENS LIMITED

MONTREAL,	TORONTO,	COBALT,	WINNIPEG,	CALGARY,	VANCOUVER
318 St. James St.	73 Victoria St.	opp. Right of Way Mine	259-261 Stanley St.	Samis Block	365 Water St.

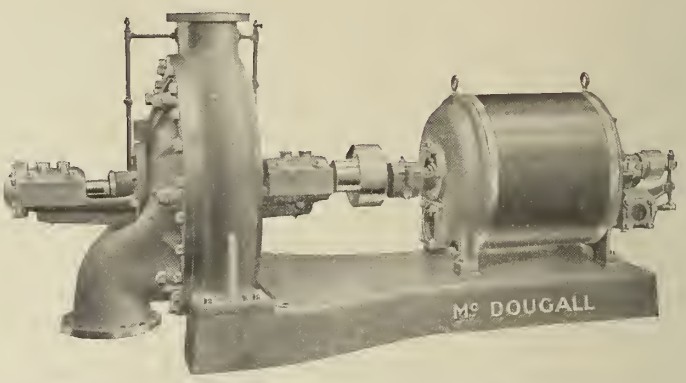
KERR STEAM TURBINES

NOISELESS IN OPERATION

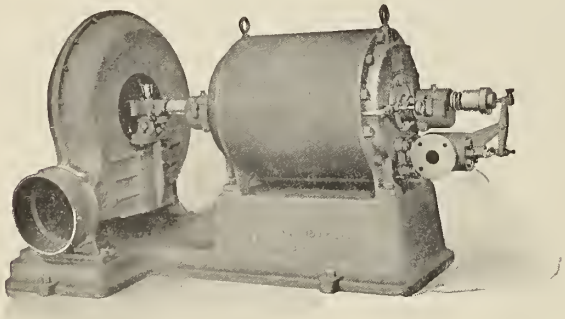
COMPACT IN FORM

EASY TO MANAGE

As a means of propulsion for centrifugal pumps no machine has yet been devised which fills the bill as satisfactorily as the small steam turbine. Because of its superior range of speed it is possible to get a unit of much smaller diameter than would be necessary in a larger pump driven by a reciprocating engine. To those unfamiliar with the modern turbine and the centrifugal pump the power and speed of these machines is almost incredible.



75 H.P. Turbine at 1500 R.P.M., driving turbine pump, capacity 1000 Imp. Gals. per Min. 150 ft. head.



Kerr-Turbo Cupola Blower Unit, Throttle or Governor Control.

Cupola Blowers with Turbines direct connected avoid the use of belts and countershafts. The speed at which the blower must run is the most advantageous speed for the Turbine; the combination is, therefore, an ideal one. Reliability and certainty of operation in the case of a cupola blower is of the utmost importance.

Send for Bulletin No. 19

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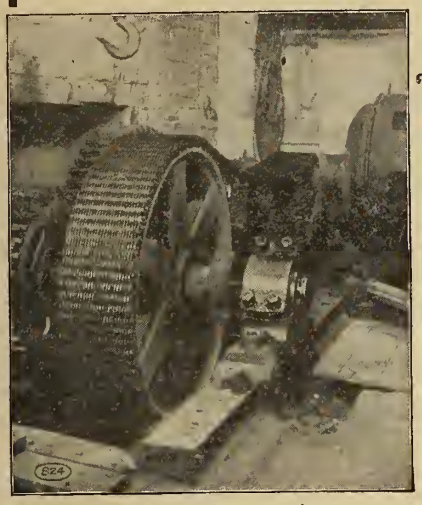
LIMITED

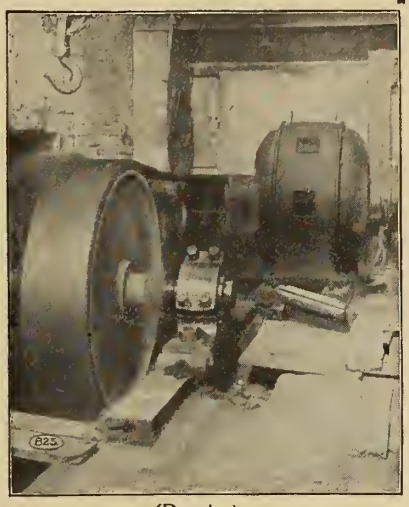
Works 512 William Street, MONTREAL

Renold Patent Silent Chains

150 H.P. Renold Chain Drive to a lineshaft driving crushing plant



(Drive Stationary)



(Running)

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transmit any power at a high speed quietly.

No Slipping, saves power continuously.

Runs either forward or backward, fast or slow and is not affected by either heat, cold or moisture.

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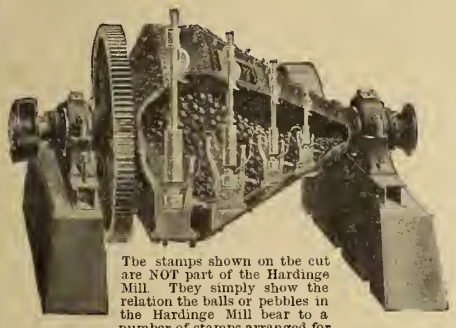

Tbe stamps shown on tbe cut are NOT part of the Hardinge Mill. Tbey simply show the relation the balls or pebbles in the Hardinge Mill bear to a number of stamps arranged for **Ideal Stage Crushing**

THE SCREENLESS PATENTED

HARDINGE MILLS

ARE BUILT IN VARIOUS SIZES FOR

GRINDING

GOLD & SILVER ORE

GRANULAR (For Concentration)

TO A SLIME (For Cyanidation)

Note comparison between the modern and old methods of reduction whereln power is automatically adjusted to results.

We have a test mill in operation in New York with which we will be glad to prove all claims.

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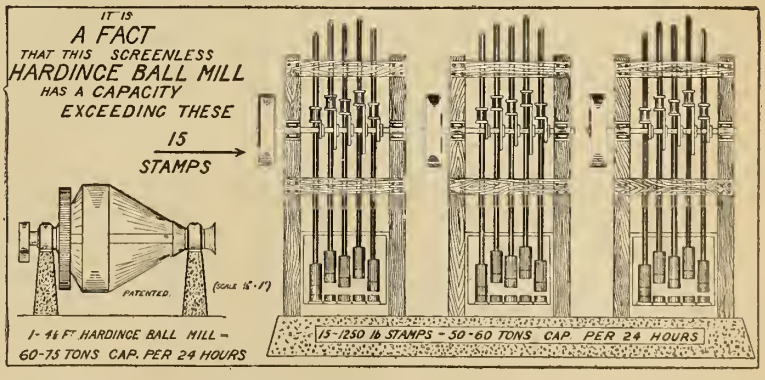
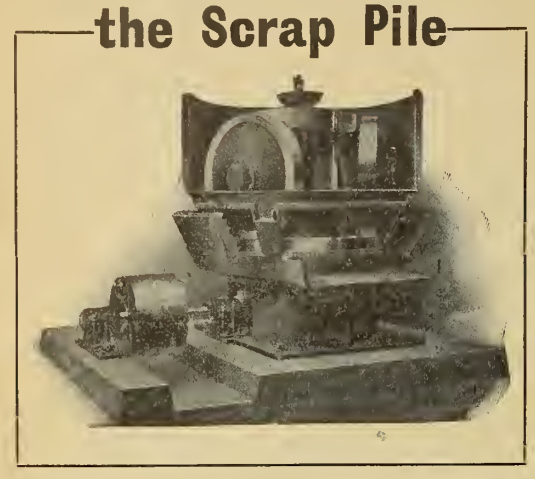

IT IS A FACT THAT THIS SCREENLESS HARDINGE BALL MILL HAS A CAPACITY EXCEEDING THESE 15 STAMPS
PATENTED
1-4½ FT. HARDINGE BALL MILL — 60-75 TONS CAP. PER 24 HOURS
15-1250 lb STAMPS - 50-60 TONS CAP. PER 24 HOURS

Put Your Chile Mill in the Scrap Pile



Do you know that it has been demonstrated by the use of our Chile Mill, that it would be cheaper, in the long run, to scrap any other make and install our Perfect Automatic Mill. The tires and dies wear longer, it has increased capacity, the spindles don't break and it consumes 50% less power. May we quote you prices.

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TORONTO, ONT. WINNIPEG, MAN.
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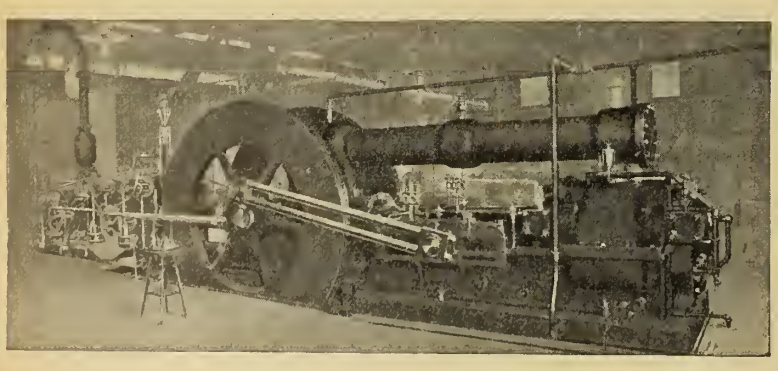
YOU CAN AFFORD CHEAP AIR

ARE YOU GOING TO BUY AN AIR COMPRESSOR? IS THE COST OF YOUR AIR ANY OBJECT?



The price of a cross-compound Corliss machine of the first class may seem beyond your means. But before you select a low priced slide valve compressor, which will COST YOU THREE TIMES AS MUCH AS THE "CORLISS." EVERY DAY FOR COAL, read the rest of this.

You can afford proper fuel economy, and keep your air cost down where it belongs, by selecting a SULLIVAN TANDEM CORLISS TWO STAGE COMPRESSOR. These machines have every advantage that the cross compound has, but the size, weight and price are all less. They cost us less to build, and sell, because they are simpler, have fewer working parts and are carried in stock sizes. They cost you less to install, because they weigh about a third less than the cross compound and require about half the foundation and floor space.

We have convinced many critical engineers; now we are getting their repeat orders.
Shall we send bulletin 658 D and figures?

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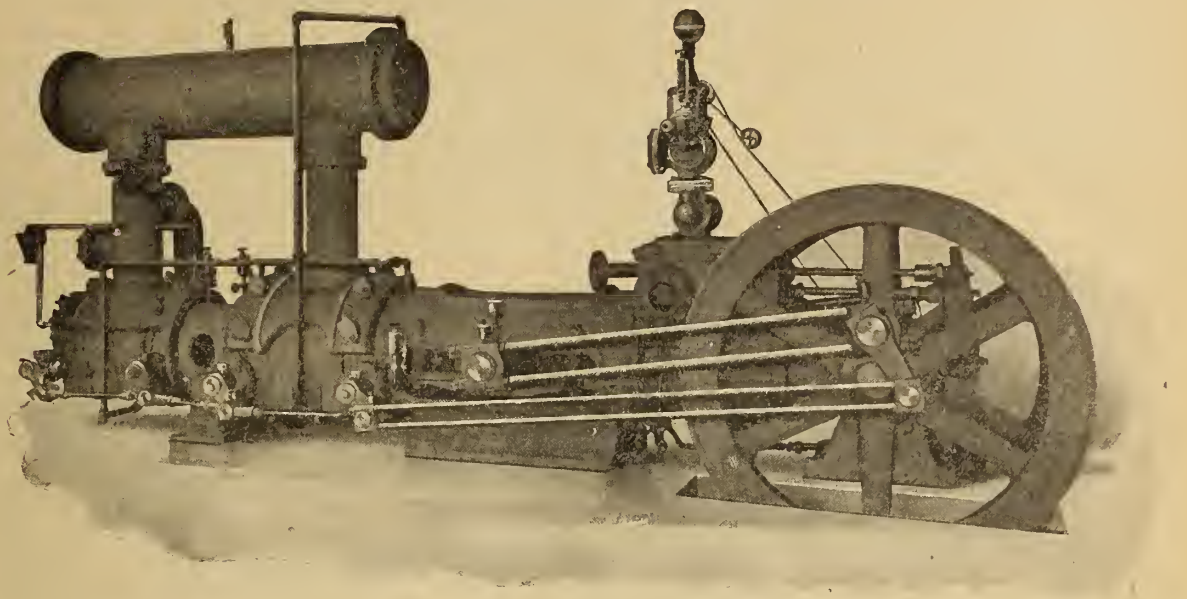
COMPOUND Air Cylinders should INTEREST

AIR COMPRESSOR PURCHASERS



¶ For service where good attendants are hard to get or for semi-permanent duties, the compound straight line steam driven machine illustrated above embodies many highly desirable features.

¶ Every feature of economy that characterizes our compound duplex Compressors is embodied in the air end of this straight line design.

¶ This new machine is the embodiment of all the best known modern principles of air compression and shows efficiencies second to no other type.

¶ Operating conditions such as fuel costs, attendance, etc., vary so much in different places that it is impossible to say what economies may be effected with any machine but the COMPOUND AIR CYLINDERS of this Rand Class "C-2" compressor mean 15% to 20% saving in power costs over single stage compression. This saving alone, based on the nominal figure of $50 per H.P. per year, means a total saving of $900. per year over single stage compression. Yet the first cost is but very little more than that of the single stage machine.

SOME FEATURES OF THIS DESIGN

¶ The machine is provided with a combined speed and pressure governor. The speed governing element is driven by a belt while the pressure element is connected by a pipe to the air receiver. The design is such that the speed is always under the control of the air pressure thus maintaining steady air pressure and enabling the machine to run very slowly without stopping.

¶ The steam cylinder embodies many advantages. The ports are short and direct and of large cross-section. The exhaust passage in particular is designed to reduce back pressure to the limit. The cylinder barrel and steam chest are protected against radiation by a sheet steel lagging.

¶ The balanced steam valves are provided with special ports and are designed to automatically take up wear ot all surfaces, insuring a permanent condition of tight valves and low friction. Adjustment of the cut-off may be made from one-third to three-quarters stroke, while the machine is in operation.

¶ These and other advantages of this steam cylinder mechanism combine to make it very economical in steam consumption and most reliable in its simplicity.

The annual cost per foot of air is far more important than the first cost of an air compressor.

CANADIAN RAND CO., LIMITED

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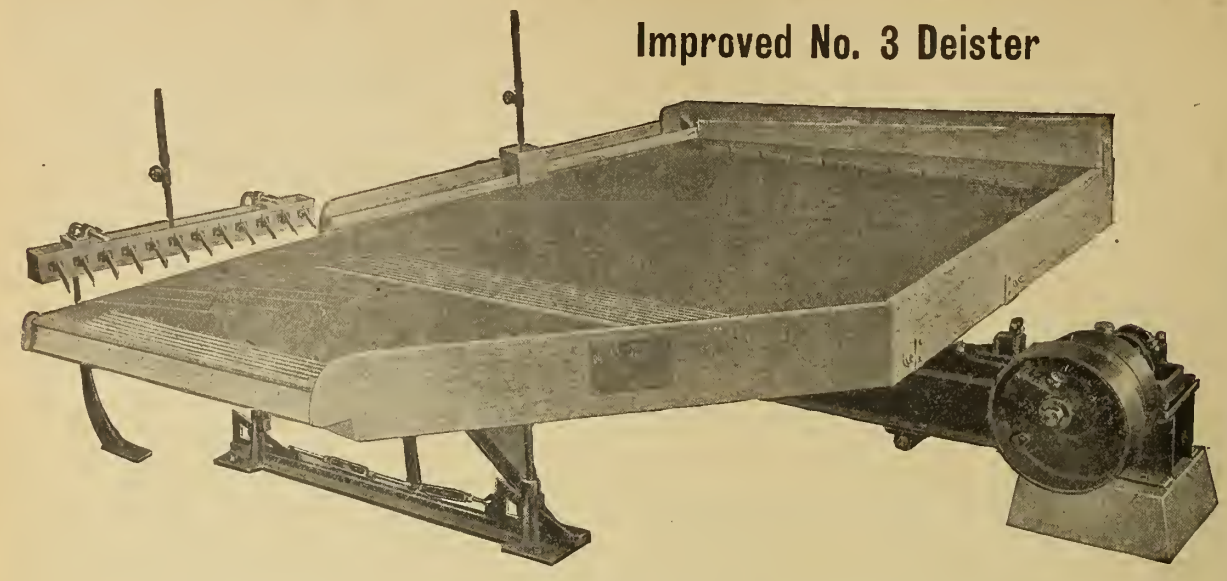
Improved No. 3 Deister



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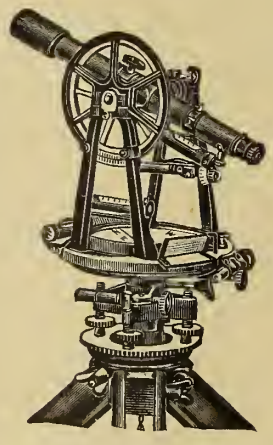

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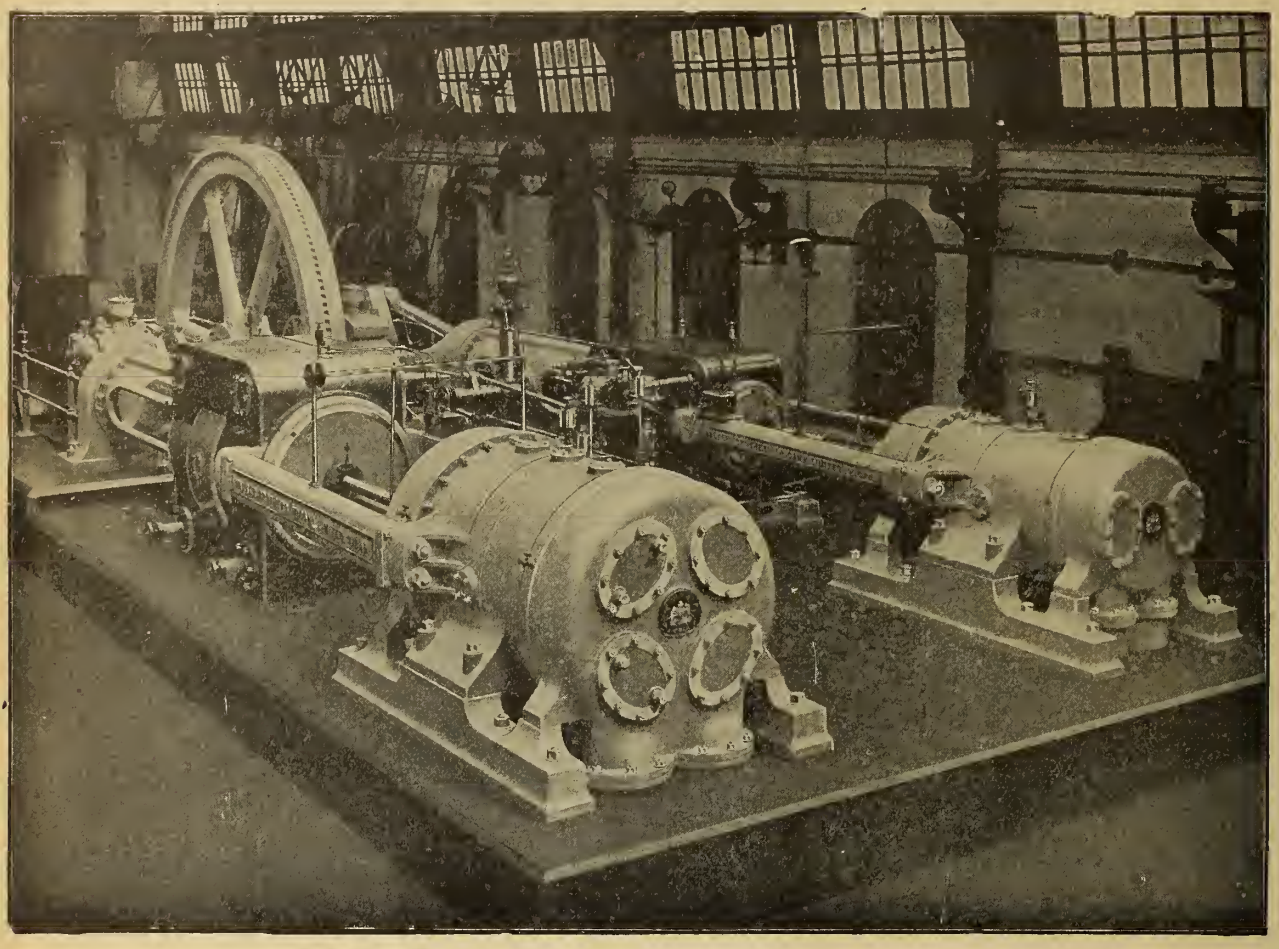

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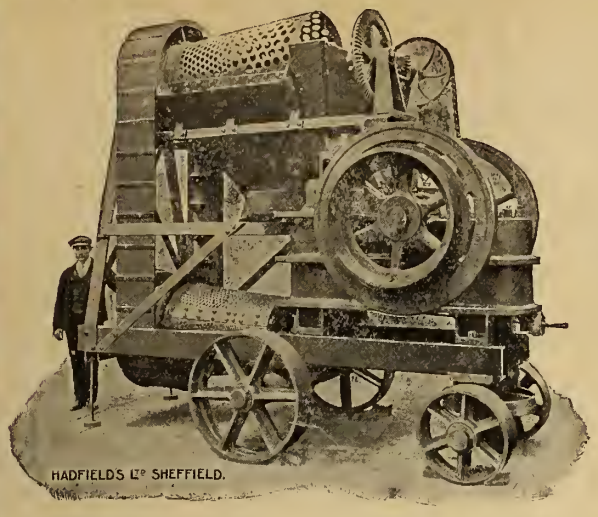

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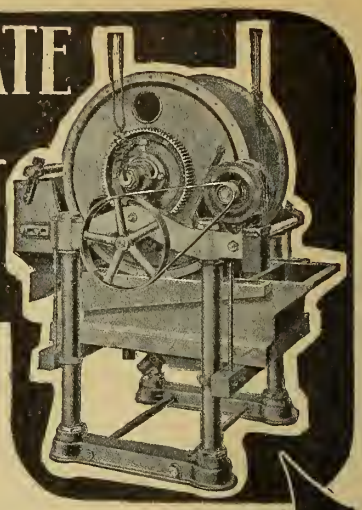

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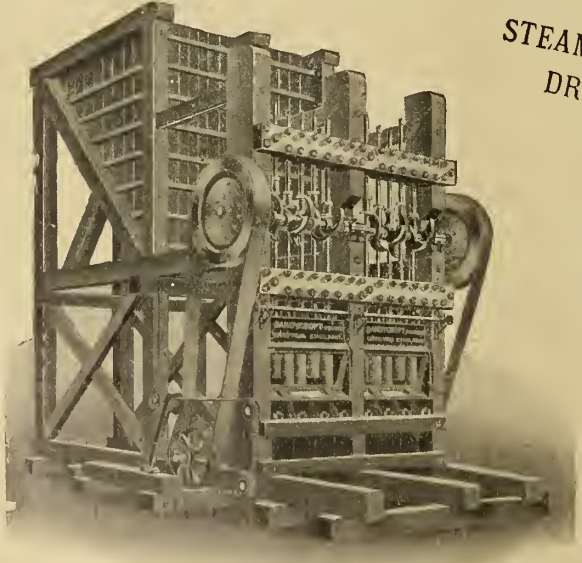

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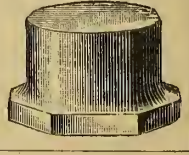

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Satisfactory Quality at a Satisfactory Price

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Pit Rails, T Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel 3/8" to 1/4" Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting 5/8" to 5" true to 2/1000 part of one inch. A full stock of Mild Flat, Rivet Round and Angle Steels always on hand

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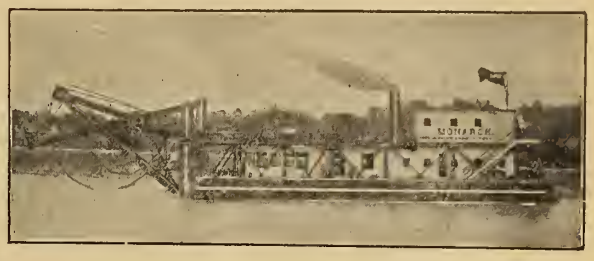

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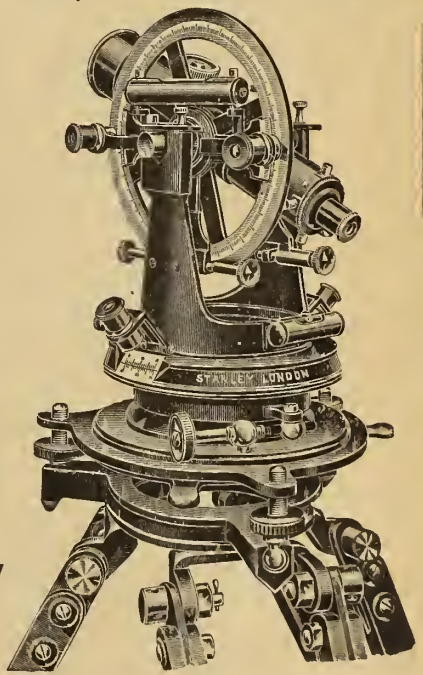

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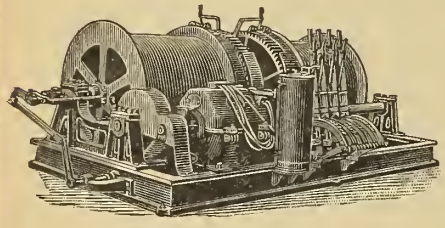

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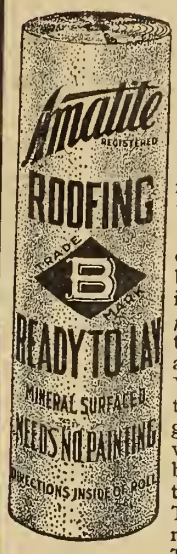

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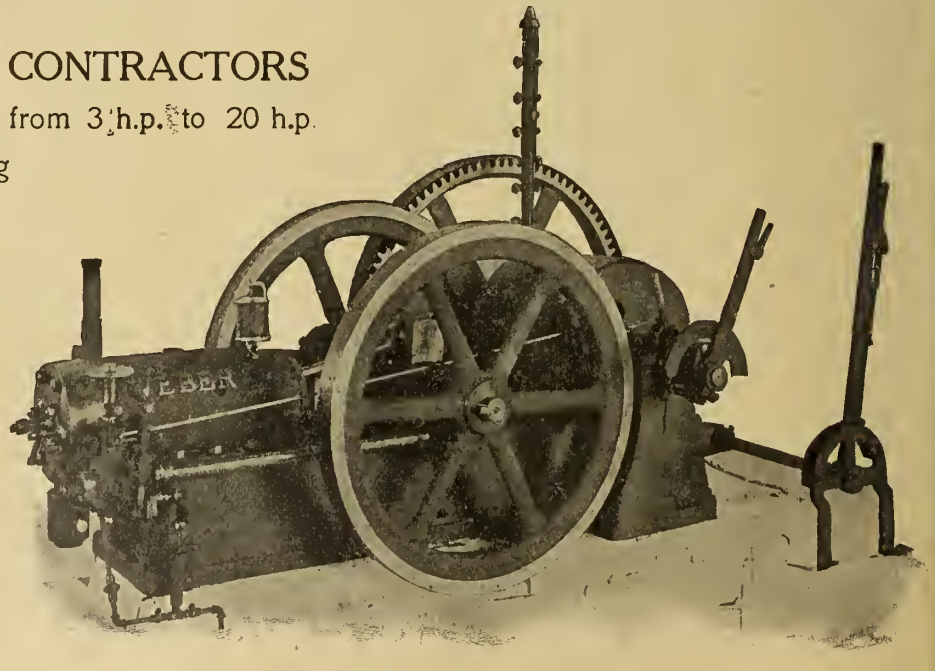

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Dear Mr. Editor,—

Thanks for your kindness in allowing me the privilege of appealing at this Christmas time on behalf of the Hospital for Sick Children, Toronto.

I make this direct appeal to the people of Ontario, for the fathers and mothers of Ontario, outside the City of Toronto, have precisely the same claim for their sick children as regards the privileges of the Hospital, as parents who reside in this city.

In brief the sick children from any place in Ontario whose parents cannot afford to pay, is, on certificate from a municipal officer of any city, town, village or township, treated free.

This is a privilege not granted by any Hospital in the Dominion, or on this Continent.

Let me, in a few words, state that in the last 20 years, since 1891, there have been 4,731 patients from 450 places outside of this city treated free, as the parents were unable to pay for treatment. Last year 384 patients from 234 places outside Toronto were so treated.

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Surely we have a fair claim for help from the people of this Province.

Every day is Christmas to the child whose little life is saved, or whose crippled limb is straightened with the might of money—your money—and the mercy of the Hospital.

Will you, the reader of this letter, think of what your dollar will do? It helps to restore health and strength, and gives sound limbs and straight feet to crippled boys and girls.

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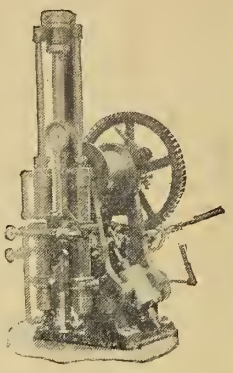

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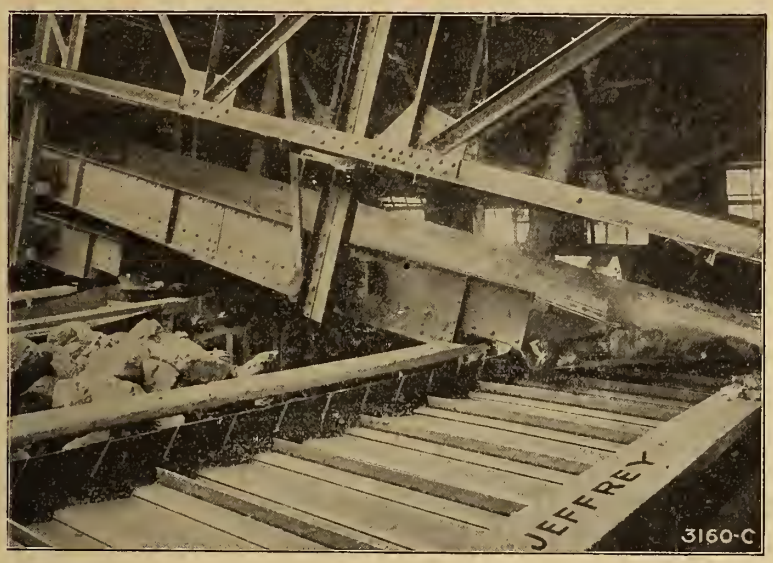

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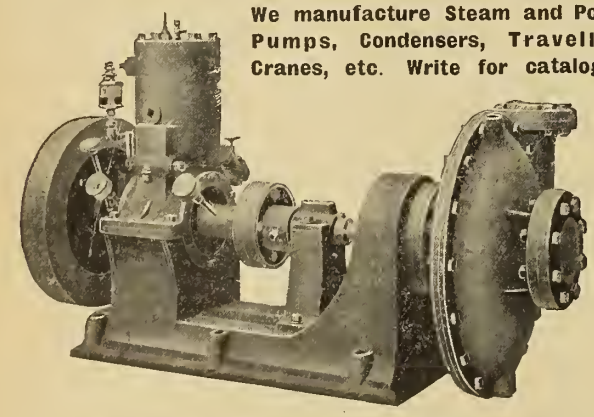

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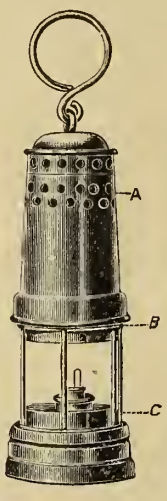

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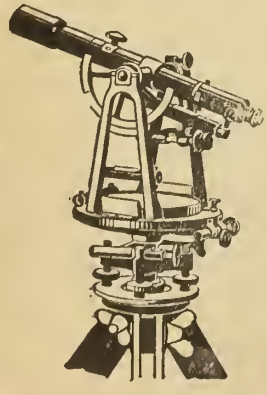

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, Jan. 1, 1912 No. 1

The Canadian Mining Journal

With which is incorporated the
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THE YEAR 1911.
A Review.

In even greater degree than its predecessor, the year 1911 has brought expansion, new growth, and stability to the varied branches of Canada's mining industry. Mining is attaining rapidly its proper national status. Since the total value of the mineral output for the year will probably exceed $120,000,000, this is as it should be.

Nova Scotia.—Amongst the larger industries, coal mining in Nova Scotia and in the West has made large strides. The outputs in Nova Scotia are the largest on record. Had it not been for labour troubles, this would also have been the case in Alberta and British Columbia. Nevertheless, much advance has been made in opening new fields, and in the underground development of established mines, and the output of Vancouver Island collieries exceeds that of all past years.

Quebec.—Asbestos mining, the backbone of Quebec's mineral industry, has fallen on evil days. Saddled with extravagantly large capitalization, the Amalgamated Asbestos corporation has thrown up the sponge after about two years of strenuous effort. Re-organization and dehydration are soon to be effected. A multitude of small investors will suffer. But the enterprise, as such, should survive.

Ontario was the cynosure of all eyes during 1911. Cobalt, overshadowed in the public mind by Porcupine, attained a production of silver that is larger by some millions of ounces than was the yield of 1910. Porcupine will rank as a producer of gold before the snow disappears. Copper Cliff, maugre Dr. Day and his sinister vaticinations, is still earning lordly incomes for the International Nickel Company. Incidentally, its plant has been added to and partly reorganized, and its prosperity is not abated.

In the Michipicoten region, at the Magpie mine, The Lake Superior Corporation is opening up huge bodies of siderite, which, it is expected, after calcination, will supply a very large demand for Bessemer iron ore.

Half-hearted attempts have been begun to work several abandoned gold mines in the Lake of the Woods district, but the only profitable activity appears to be confined to the St. Anthony mine, near Sturgeon Lake.

Eastern Ontario has experienced a distinct revival. The erection of an iron ore concentrating plant at Trenton will give an impetus to Hastings County mining. The long-neglected gold mines of Hastings and Frontenac Counties are being looked into. The talc industry is flourishing. Corundum is holding its own.

The Bancroft marble quarries are producing acceptably. In fact the two counties have not for many years been the centre of so much attention.

As has been the case for some years, the production of petroleum has fallen off in southermost Ontario, while the yield of natural gas has increased.

Manitoba, except for her clays, marls, and limestones, is practically a negligible factor in mining. Like New Brunswick, this province pays practically no attention to exploiting her mineral deposits.

Alberta's coal production will probably show a measurable decrease. For the past four years the annual output of coal has been climbing steadily and rapidly. The retrogression must be credited to the foreign labour agitator.

British Columbia's total mineral output, according to the estimate of our correspondent, Mr. E. Jacobs, than whom it would be hard to find a more reliable informant, will show a decided drop. Two causes are responsible for this: First and foremost, the coal miners' strike, which brought about a coke famine in southeastern British Columbia, and thereby curtailed smelting operations; and, second, the fact that the railway trestles and bridges on the line of the Kaslo and Slocan Railway, a line that taps the rich Slocan silver-lead and zinc district, have not been replaced since the destructive fires of last year. On the other hand, apart from these fortuitous circumstances, the province has not been standing still. The Consolidated Mining and Smelting Company has improved its position markedly, notably at the War Eagle mine, Rossland. The Sheep Creek gold mines have shown up well. The Hedley Gold Mining Company has produced heavily and has, moreover, developed considerable ore reserves.

Placer gold shows a decline. Both Barkerville and Atlin yielded less in 1911 than in 1910.

Work in other inland districts and on the coast was more than usually active. In a word, a year of industrial peace will make British Columbia a much closer second to Ontario than is now the case.

The yield of gold from Yukon Territory is slightly in excess of that recorded for last year. A larger output would have been won had not serious delays occurred in assembling the members of several large dredges that were to operate for the Yukon Gold Company.

GENERAL.

Technical Education.—The appointment of a Royal Commission to investigate questions pertaining to technical education was the salient feature of the year. After taking evidence all over the Dominion, the commissioners began their tour of Europe and the United States. Their final report will not be issued before two or three years shall have elapsed. Meanwhile throughout their Canadian itinerary they succeeded in creating a strong current of interest.

The three leading mining colleges, McGill, Kingston School of Mines, and Toronto, have done good work. McGill University, relieved of its burden of debt, will, doubtless, enlarge its boundaries. The university's mining department ranks easily among the most important of its faculties, and it is even more in need of financial aid. This it should receive without delay. The Kingston School of Mining, the pioneer in Canadian mining education, is equally deserving. Its academic requirements are now remarkably stringent, and it is turning out competent graduates. The mining department of the University of Toronto is aggressive, and is waxing strong. Though sadly in need of a larger staff, it is live and efficient.

Conservation of Natural Resources.—Much thought and effort have been devoted to the proper use of our natural resources. At its inception the commission, of which the Hon. Mr. Sifton is chairman, antagonized the mining fraternity by making certain wild statements in respect of waste in mining and smelting. After a series of more or less tropical incidents the situation was cleared.

The commission is now industriously minding its own business and will accomplish its ends unless it follows the example set by the quixotic Pinchot and his confreres. Already it has made a grave mistake, a mistake that argues absence of tact. At the very inception of the commission no sufficient steps were taken to work in sympathy with other departments. This is precisely what led to the contretemps referred to above. Yet, to its credit be it said, the commission's policy, impracticable as it may have been at first, is changing gradually for the better. It has much deadwood in its personnel. This should be lopped off. Live, keen, practical men are needed. In short, the commission requires to be popularized.

Legislation—The committee of the Canadian Mining Institute that was authorized by the Dominion Government to codify the Federal mining laws has met frequently. Gradually the proposed statute is being moulded into shape. In due course it will be submitted to Parliament—the sooner, the better.

The Province of Quebec has wrought radical changes in its Mines Act. These have been amply noticed in previous issues of the CANADIAN MINING JOURNAL.

The whole broad and intricate problem of workmen's compensation is being threshed out by various Ontario branches of the Canadian Mining Institute. This, probably, will be the most absorbing topic of discussion at this year's meetings.

The influx of foreign capital has brought home to Canadians the pressing need of housecleaning in matters relating to the administration of our heterogeneous mining laws, and in the character of the laws themselves.

We noted with regret a short time ago that the Hon. Mr. Borden had indicated that he had no intention of submitting to the House any bill dealing with the control of explosives. In regard to this we would urge that all possible pressure be brought upon the Dominion Government to take up this subject without delay. Neglect of this would be stupid and criminal to a degree. Nothing could exculpate the Government were more lives to be lost in catastrophies like those that have occurred in the last twenty-four months.

Departmental.—Full accounts of the field work of the mines branch and the geological survey branch of the Department of Mines will appear in our next issue. It suffices here to say that there is now noticeably less overlapping and duplication on the part of the two branches. Whilst the survey aims more and more to direct its efforts along economic lines, the mines branch is attempting to attain directly commercial results. It is fast becoming what it was intended to be, an essentially technologic departmental unit.

The Canadian Mining Institute.—No outward and visible ripple has disturbed the perfect peace that has brooded over the institute since last we wished our readers a Happy New Year. After an effervescent annual dinner, no more bubbles have risen to the surface. The president, the secretary, and members of the council have wisely encouraged the formation of branches. The Porcupine meeting, at which the Porcupine branch was formally organized, was an unqualified success. Other branches are needed at such places as Sudbury, Kenora, Sherbrooke, and Sydney. Amongst existing branches, Toronto possesses probably the most vigorous.

It may do no harm to compliment the secretary upon the quality of the last bulletin, which, typographically and otherwise, deserves appreciation.

The Profession—Canada generally, and Toronto and Montreal in particular, have become popular hunting-grounds for many mining engineers from foreign parts. The number of consulting mining engineers, with headquarters in Canadian cities and towns, has doubled in the last year. Not all are making headway. But the majority are doing well. We doubt, however, if the Canadian public, many sad lessons notwithstanding, has a saving sense of its own needs. This will come in time.

Opportunities.—So often have we expatiated upon the chances that offer themselves to the mining investor in Canada that now we shall merely recapitulate a few. Our lists are confined to the more or less settled regions.

In Nova Scotia the best opportunities are available in mining and manufacturing gypsum, in mining and smelting auriferous antimony ore, in manganese mining, in tungsten mining, and (with qualifications) in gold mining.

New Brunswick proffers excellent openings in gypsum, iron ore, manganese ore, oil, natural gas, and, possibly, copper and gold.

Quebec, as mentioned above, holds out chances of rich copper ore in the Sherbrooke region. Placer gold promises well in the country drained by the Riviere du Loup. Magnesite should be the basis of a thriving industry; and mica, despite an erratic market, can be made to yield handsome profits.

Eastern Ontario contains a bewildering variety of commercially valuable mineral deposits. Pyrites, marble, actinolite, feldspar, sodalite, etc., etc., await cautious exploitation. Both here and in western Ontario the investor can have a good run for his money if he cares to investigate the best of the old gold mines. Fortunes will yet be made out of some of these.

The long-deserted silver mines of the Thunder Bay District will some day become fashionable again. A study of their history, as recorded in the records of the Geological Survey and of the Ontario Bureau of Mines, gives constructive evidence of their general intrinsic value.

In Albertan coal lands much German, Belgian, English, American, and Canadian capital has been and is being investigated. Some of these investments are unquestionably sane; many are worse than foolish. Investors of all kinds will never receive equal justice, and the better class will never feel any sense of security until the Province of Alberta controls her own natural resources.

British Columbia, blessed with equitable laws, should prove more and more attractive to the capitalist. Here, in our opinion, the outstanding opportunity lies in the development of an iron and steel industry on the coast, where Providence has placed all the necessary material, and where that material can be transported cheaply. To enumerate the promising openings in British Columbian metal mining would be a Herculean task. It must suffice to say that the range of choice is exceeded by no other country and is equalled by few.

* * * * * *

That our country will continue to flourish, that Canadians will prove worthy of their high destiny, that the industry that we represent will, under the guidance of Canadians, form the foundation-stone of our national growth, is our most earnest hope. Here's to the New Year!

THE NATURAL CONCENTRATION OF GOLD.

In the Canadian Mining Journal for June 15, 1911, we gave a lengthy editorial notice of an article entitled "Certain Natural Associations of Gold." This article, written by Mr. F. C. Lincoln, appeared in the April-May number of Economic Geology. The October-November number of our excellent contemporary contains a letter by Mr. J. B. Tyrrell, commenting upon one of Mr. Lincoln's statements.

The statement commented upon is to the effect that the placer gold of Klondike represented an original gold content of about two cents per ton of rock eroded.

Quoting from a contribution of his own in Economic Geology, Mr. Tyrrell assumes that a thickness of 900 feet over an area of 800 square miles, equivalent to 1,600,000,000,000 tons of rock, was eroded and concentrated by natural agencies. The resulting placers yielded about 10,000,000 ounces of gold. This represents an original gold content, not of two cents per ton but of 0.013 cents per ton of original rock in place.

The opportunities offered in the Klondike district for approximate computations of this kind are exceptionally good. On the assumption that only one-third of the gold originally in the rock was collected in the placers of the present streams, Mr. Tyrrell points out that this would place the gold content of the rock at .04 cent. of gold per ton—a figure that he believes to be much nearer the average gold content of the igneous and metamorphic rocks of the earth's crust than Mr. Lincoln's estimate, which was three and a half cents per ton.

IN PRAISE OF THE GEOLOGIST.

Mr. Arnold Bennett, the most brilliant of a brilliant group of contemporary English novelists and essayists, has something good to say of the geologists in his Christmas book, "The Feast of St. Friend."

The decay of the old Christmas spirit he attributes to men of science. "It is due," says Bennett, "to the "labours of a set of idealists—men who cared not for "money, nor for glory, nor for anything except their "ideal. Their ideal was to find out the truth concern- "ing nature and concerning human history; and they "sacrificed all—they sacrificed the peace of mind of "whole generations—to the pleasure of slaking their "ardour for truth. . . . They would leave naught "alone; and they scorned consequences. . . . I "mean the great philosophers and men of science—es- "pecially the geologists—of the nineteenth century. I "mean such utterly pure-minded men as Lyell, Spen- "cer, Darwin, and Huxley."

What higher eulogium could be bestowed? The geologist has profoundly influenced and modified every department of human thought. Religious dogma he has undermined. Superstition he has dissipated. The orderly sequence of his mental processes and the finality of his logic have left their mark upon all literature.

In fact, the geologist is at once the intellectual magistrate and the conservor of tradition.

McGILL'S SUCCESS.

Canadians will rejoice at the good fortune of McGill University. Adopting the modern cyclone method of collecting a large amount of money within a few days, the friends of the University announced that they would attempt to gather in $1,000,000 within five days. On the evening of the last day of the campaign, Saturday, November 25th, the good news was made public that the sum of $1,526,765 had been collected. The citizens of Montreal, the three large railway corporations, and the students themselves, had responded to the appeal in a manner that surpassed all expectations.

In this spectacularly successful incident it is well to remember that the devotion of the Principal and of his staff have roused the practical sentiments of the public. "McGill has found her friends" was the Principal's comment, when he heard the result.

McGill will have no difficulty in holding the friends that she has found. And these friends will bring more help than could be expected from any government.

EDITORIAL NOTES.

No industry lives unto itself. Mining is the mother of all industries. But even in mining regions the amenities of life cannot be overlooked, which is all a quite superfluous introduction to what we intend to say, namely, that there should be hotel inspection in Northern Ontario. Porcupine is well supplied with accommodation for the visitor. Cobalt, on the other hand, is unspeakably undesirable. Its hotels cumber the ground.

The necessity of low operating costs on the Rand is creating a demand for competent supervision. The conditions are unsuited to the employment of white labour. But white supervision is certainly required. The best informed authorities affirm that this is the only function of the white man on the Rand. Coloured labour will always be the staple.

"Lucky Jim," the B. C. zinc mine, is providing a harvest for the newspapers. The marketing of zinc concentrates presents more than enough difficulties and complications. The advertisements of the "Lucky Jim" flotation contain about one per cent. truth highly diluted with imagination, fabrication, and fiction.

CORRESPONDENCE

ORIGIN OF PETROLEUMS.

Editor, Canadian Mining Journal:

Sir,—In your issue of Nov. 1st a letter appeared from the pen of Mr. Eugene Coste, in which he somewhat elaborately discusses the origin of petroleum as non-organic.

While not claiming to have been as exhaustive a student of such phenomena as evidences, I am, nevertheless, not convinced of the soundness of the conclusion at which Mr. Coste arriver from facts and assertions (I say, assertions, because, in my opinion, some of his statements lack proof), on which he founds his deductions. He takes the position that petroleum had its origin in vulcanism. While it may be true that vulcanism developed petroleum, may it not have produced it by simply transferring it from a wide area of

pre-existing organic material to appreciable quantity in natural reservoirs, just as oils are often collected in properly arranged vessels by distillations.

The oils of commerce are, many of them, obtained by processes of pressure, distillation and absorption; and in the laboratory of nature it is reasonable to conclude that oil would be produced by similar operations from organic material. It is assuming too much to say that petroleum could not have travelled from remote sources through porous rock, because the rocks were already saturated with water, for we do not know that at the time of absorption and transmission the rocks were not deprived of most or all of their moisture by heat, and, further, we do not know that the rocks now saturated with petroleum were not characterized by greater porosity when saturated. It is a fact of general acceptance that the vast bodies of limestone found in all countries are of animal origin chiefly. These organisms must have existed in immense quantity to form, when consolidated, beds of rock hundreds of feet in thickness. Further, these beds have in many instances been changed by heat into granular limestone or marble, in which all traces of animal organisms have been obliterated.

During these processes of heat, evaporation, and solidification, it appears to me quite reasonable to infer that any petroliferous matter contained in the organisms constituting the main source of these rocks would, on expulsion by pressure and heat, percolate through the comparatively porous rocks previous to their final solidification; and accordingly we find many limestone strata, most effected by heat, in which no trace of oil, or even of the organisms from which the oil is supposed to have been derived, is discernible. But this is not always the case. Previous to the discovery of oil deposits in Western Ontario, petroleum was produced by distillation of a layer of rock found between Owen Sound and Meaford. The product, a good illuminating oil, was sold at that time in Kincardine at $1.25 per gallon. Shortly after the Petrolea oil came on the market, the distillation works burned down. Meanwhile the price of petroleum became so reduced that it was not considered advisable to rebuild. Some time after, the writer, on driving through that section, took occasion to examine the rock from which the oil had been produced, and found it to consist of a stratum of solid black rock composed almost wholly of fossil remains, chiefly trilobites, many of the markings of which were very distinct. This layer was horizontal and occurred between other strata of limestone, much lighter in colour, and in which the fossil tracings were much less prominent.

From the foregoing facts and observations, I came to the conclusion that, however true it may be that, in some instances petroleum may have seemed to have had its origin in petrological metamorphism, its true origin was either animal or vegetable organic matter, and chiefly animal.

Yours, etc.,

J. F. LATIMER.

Toronto, Ont., Dec. 21st.

BOOK REVIEWS.

MINING WITHOUT TIMBER—By Robert Bruce Brinsmade, B.S., E.M.—309 Pages—Profusely Illustrated—Price $3 net—Published by McGraw-Hill Book Company, 239 West 39th Street, New York, 1911.

Mr. Brinsmade's object in compiling his very timely book was to supplement such works as Mayer's "Mining Methods in Europe," Storm's "Timbering and Mining," Ingalls' "Economics of Mining," Hoover's "Principles of Mining," and Finlay's "Cost of Mining." His attempt has been limited to describing generally accepted theories and leading examples of practice. Nothing more would be practicable, for the reason that timberless mining is yet in an early stage of development.

The first five chapters are general, taking up in succession the following subjects: Explosives and their use, principles of blasting ground, compressed air for mining, principles for controlling excavations, and principles of mine drainage. Nearly all the remaining chapters are made up of descriptions of actual practice in the United States and other countries. Surface shoveling, surface mining, underhand stoping, overhand stoping with shrinkage, in fact, all the standard stoping, caving, slicing, longwall, and pillar systems are set forth.

As mentioned above, the book opens with a discussion of the character and use of explosives. This chapter appears to the reviewer to be particularly meritorious. It is elementary; yet it is also instructively detailed. The composition, reactions, exploding temperatures, etc., of each class of explosives are explained, and the physical qualities of each are outlined. A few paragraphs on "misfires" are added.

Chapter II., containing clear diagrams, goes into the principles of blasting ground. Here are discussed the relations of geologic structure to the methods of drilling, loading, and firing.

Chapter III. describes the underlying principles of the use of compressed air. Control of excavations is the subject of Chapter IV. The control of the roof, and the control of sides and floor, and of the whole overlying formation, are considered separately.

Problems of mine drainage are considered in Chapter V. All of these chapters contain typical examples and practical working formulae.

Chapter VI., "Surface Shoveling in Open Cuts," opens with a description of the equipment of the Mayo and Mayari Mines, Cuba. Other examples from the Mesabi Range, from the Utah Copper Mine, from the Nevada Consolidated, and from the Eastern Pennsylvania and Illinois anthracite fields are given. In each instance all necessary commercial data are included.

The following fifteen chapters cover surface mining, underhand stoping, overhand stoping with shrinkage, overhand on waste in the United States, overhand on waste in Mexico and Australia, overhand with shrinkage and delayed filling, overhand with shrinkage and simultaneous pillar-caving, back-caving into chutes or chute-caving, block-caving system, slicing under mats of timber in barrels, slicing under ore with back-caving in rooms, principles of mining seams, advancing longwall systems for seams, pillar systems for seams, and flushing systems for filling seams and recovering pillars.

Chapter XXII. is a summary comparison of the various mining systems mentioned above. Principles of mine evaluation is the subject of Chapter XXIII.

A tabulated list of the chief magazine articles from which much of the subject-matter of the book was extracted, is appended immediately after Chapter XXIII. This is a great improvement upon the distracting foot-note.

While, incidentally, we regret that Mr. Brinsmade has overlooked many excellent examples of mining in Canada (not one Canadian mine is referred to), we cannot but commend both the form and the matter of the book. It is worthy the attention of both the coal-miner and the metal-miner. The horizons of both will be broadened by a close study of this volume.

We predict that in due process of time "Mining Without Timber" will go through several editions. It does not "fill a long-felt want," for the reason that it is strictly modern. It does, however, supply a present need. Author and publishers alike are to be congratulated.

THE FRENCH PROCESS

Mr. A. Gordon French, a metallurgical chemist, who had previously been making experiments in connection with the reduction of lead-zinc ores, has patented a process which is the outcome of his investigations and experiments. A well-known metallurgist thus describes and comments on this process:

"Mr. French's process aims at the extraction and recovery of the zinc contained in ores such as the silver-lead-zinc ores of the Slocan district of British Columbia, leaving as a residue the silver-lead, iron and gangue matter, which would be afterward smelted in the same manner as a lead ore free from zinc.

"The advantages claimed for such treatment would be:

"1. The recovery of the zinc in a metallic and marketable form.

"2. By the removal of the zinc from the original ore—(a) the residue would become a lead ore free from zinc and as such would obtain a lower smelting rate and avoid any 'zinc penalty' that would have been attached to the original ore; (b) the residue, carrying all the lead and silver of the original ore would be less in weight than such original ore, by the weight of zinc extracted. Consequently it would contain a higher percentage of lead and silver and there would be a proportionately lessened tonnage to smelt.

"3. The silver actually occurring in the blende would remain in the residue and so be recovered by smelting, whereas it would be lost if the zinc-blende were to be separated from the lead ore by any mechanical process.

"**Ores Experimented Upon.**—The ores experimented upon have been chiefly zinc concentrates containing galena, zinc-blende, iron pyrites, and iron carbonate together with the gangue matter, quartz and shale, and apparently a percentage of manganese in some form.

"**Treatment.**—The ore is crushed to pass through a 10-mesh screen. It is then roasted in an ordinary calcining furnace until the ore is nearly 'dead,' which reduces the original sulphides, theoretically, to oxides, although in practice there are probably sulphates and some sulphides left, depending in quantity upon the completeness of the roast.

"While the roasted ore is still in the calciner, at the hot end, a small percentage of nitro-cake*, in powdered form, is thrown in with the ore and thoroughly rabbled into it, making an intimate mixture. This mixture is thoroughly stirred (rabbled) under heat for a short time. The effect of this is that the oxides in the ore are almost all converted into sulphates. When this action is considered complete the charge is removed from the furnace and allowed to cool.

"This roasted and treated ore, after having sufficiently cooled, is transformed to a wooden leaching tank, and water, in which a small quantity of nitro-cake has been placed, is added, and this dissolves out the sulphates of zinc and manganese, together with the sulphate of soda formed by splitting up of the nitro-cake.

"The sulphate of lead is not soluble and the silver can be rendered insoluble. These remain in the tank, as does all gangue.

"Mr. French claims that the sulphates of iron are not leached out until all the zinc is in solution, and if the leaching is stopped before the zinc is all out the iron will be left undissolved. Of this I am not certain and have not been able to try it, but the solutions in the works did not carry much iron, which seems to confirm his statement.

"The filtrate from the leaching tank, containing the sulphates of zinc, manganese and soda are run into a wooden box, in which are hung alternate sheets of zinc and lead, immersed in the filtrate or electrolyte. The zinc plates are connected to the positive pole and the lead sheets to the negative pole of a direct-current dynamo of low voltage.

"The action of the electric current is to plate the zinc sheet with metallic zinc, which accumulates in a dense hard mass over the entire side of the plate. When this deposit of zinc has attained the desired thickness it is lifted out and a new zinc sheet put in its place. The electrically deposited zinc is afterwards easily stripped from the zinc sheet, the latter to be used again and the former now ready for market after having been melted and run into bars.

"On the negative pole manganese is precipitated as a black oxide of manganese in a powder which is brushed off occasionally and collects in the bottom of the box. This black oxide of manganese has a commercial value.

"The filtrate from the leaching tank flows into the electrolytic precipitating box and out again, being pumped back to the leaching tank, this flow keeping the solution at a normal strength.

"The plant that Mr. French has at Nelson is only an experimental one, and is very crude, sufficient only to demonstrate the principle and is capable of treating only a batch of from 500 to 1,000 lbs. of ore at a time. The whole plant is home-made, and the process cannot be demonstrated in it.

"The plant consists of a small calcining furnace, with a hearth about 20 feet long by about 5 feet wide, built of concrete with a brick arch, heated by cordwood used in an ordinary firebox, working doors on one side only.

"The calcining hearth is inclined at an angle of about 10 degrees for the upper part of its length, but is level for the lower 5 feet. The ore is fed in at the upper end through the side door by shovel and is rabbled by hand.

"There is one leaching tank, also two wooden tanks for the storage of solutions."

*Nitro-cake is a bisulphate of soda with some free sulphuric acid in it and is a waste product of sulphuric acid works.

BRITISH COLUMBIA IN 1911

(By E. JACOBS.)

Statistics of mineral production in British Columbia during the calendar year 1911, when published, will be found to compare unfavourably with those of the five or six years immediately preceding. Two main reasons may be given for this seeming retrogression—one, the suspension of the production of coal and coke at the Crow's Nest Pass collieries consequent on a strike of the colliery employees, and the other, the continuance of a lack of ore concentration and railway transportation facilities for the several silver-lead and zinc mines of the Slocan district that were deprived of these essentials to production when, in the summer of 1910, forest fires destroyed surface buildings and plants at mines, and trestles and bridges along half a dozen miles of the Kaslo and Slocan Railway. However, the retarding effects of these temporary difficulties will not much longer be experienced, for production has been resumed at the coal mines and a branch railway is being built that will next summer afford suitable transportation conveniences for most of the mines that were without these throughout 1911.

But the progress or otherwise of the mining industry of the province during last year may not fairly be measured only by statistics of mineral production, for in other respects the position is entirely different, as a brief survey of some prominent features of the year will make manifest. For instance, the prospects for a larger production of lode gold were improved by several noteworthy developments. Among these are considerable improvement at the Consolidated Mining and Smelting Co.'s War Eagle mine, Rossland, in which there has been partly opened below the 12th level a body of ore in greater quantity and containing value in gold quite beyond earlier expectations of the management. Then there is much encouragement from developments in Sheep Creek camp, Nelson mining division, where a decided change for the better has occurred at the Queen mine in the opening of a large body of gold-bearing ore of comparatively high average value, while the equipment of the Mother Lode mine, in the same camp, with a stamp mill (which, it is claimed, will be among the best in the world for efficiency in gold-saving), is added to the fact that the occurrence of ore of good gold value in this mine has been proved to a depth of 500 feet assures an ore supply, sufficient ore to keep the stamp mill running continuously for three years having been blocked out. Again, not only did the Hedley Gold Mining Co. mine and mill a much larger quantity of gold ore in 1911, with a proportionate increase in gold recovered, but it developed in the deeper part of its mines ore estimated to be worth at least $1,000,000, and added this much to previously known ore reserves.

Silver and lead in much larger quantity than in recent years may be expected to be produced in the early future by Slocan district mines, for it has been most effectively demonstrated by deep-level development down to a depth of 1,200 feet that ore in considerable quantity and of high grade occurs to at least that depth, and there are indications that still deeper development will be similarly successful in revealing the presence of ore than can be mined with profit. In this connection, the initiation of the deep development of such well-known mines as the Slocan Star and Payne, both dividend-payers in former years, is certainly gratifying to those concerned in the progress of mining in the Slocan district in particular, and of deep mining in general.

The outlook for copper mining is also encouraging, for during its last fiscal year the Granby Company added 290,000 tons more ore to its reserves "in sight" than the 957,000 tons it shipped from its Phoenix mines, while, as shown in the notes that follow, the same company's developments at its Hidden Creek mine and those of the Britannia Company at its mine in New Westminster mining division, were eminently satisfactory.

The activities of the Consolidated Mining and Smelting Co., the Granby Co., and the British Columbia Copper Co., in bonding and exploiting various undeveloped properties with a view to making them productive, were also progressive.

Just a word or two concerning the Provincial Government, before turning to notice in some detail of the different mining districts. Among other aids to mining rendered by the Government may be mentioned the passing of laws regulating coal mining that are acknowledged to be about the best in the world; the adjustment of matters at issue between the smelting companies and the company that supplies their works with electric power; and the substantial work done in mining districts in constructing and improving roads and trails to give access to parts in which mining and prospecting is being carried on. The encouragement given by the Government to railway building should also be acknowledged. Doubtless there are other things that should be noted, but the main purpose in view now is to direct attention to what has been done in the mining districts of the province, as shown in the notes that follow.

Cariboo and Cassiar.—Barkerville district and Quesnel division, Cariboo, and Atlin division, Cassiar, are the two important placer-gold districts of British Columbia. Both report a decreased producton in 1911 as compared with 1910—about $460,000 from the two districts as against $522,000 in 1910. A shorter season for gravel washing is accountable for the decrease; the season opened late, and there were no fall rains to help out. In both districts there are beds of gravel available for hydraulicking. A feature in Cariboo last summer was the commencement of operations by the Quesnelle Hydraulic Gold Mining Co., which under the direction of Mr. Howard W. Dubois, of Philadelphia, has expended nearly $1,000,000 in preliminary work and equipment, and the resumption of work near Quesnel Forks by Mr. John B. Hobson, the veteran hydraulic placer miner of Quesnel division.

East Kootenay.—Metal mining did not make much progress during the year. Exhaustion of the known ore bodies of the St. Eugene lead mine, from which an aggregate of about 1,100,000 tons of ore has been taken, is near at hand, production of concentrate having decreased yearly from 28,000 tons in 1905 to less than 6,000 tons in 1911. The Sullivan has in part taken the place of the St. Eugene, but its enormous ore reserves contain much ore in which the percentage of zinc is too high to allow of present profitable treatment in this province, so shipments are not large. Construction of the Kootenay Central Railway, now being carried out, will eventually give transportation to silver

and lead mines in parts of the district now without it.

Production of coal was practically stopped during the eight months the coal mine employees were on strike, but in that period the opening of coal seams at a level 500 feet above main entry to the Hosmer mine was proceeded with, several new seams were opened at the Crow's Nest Pass Coal Co.'s Coal Creek colliery, and others at Carbonado, while the Corbin Co. opened a phenomenal deposit of coal occuring 3,000 to 4,000 feet along the surface and 300 to 400 feet wide, which will be quarried in open workings.

Ainsworth.—This and the following named divisions in West Kootenay appear to have a brighter immediate future. Spokane men with money available for development work have secured and are opening several Ainsworth properties, and the Consolidated Mining and Smelting Co. has bonded others. Arrangements are being made to resume work and ore production at the Bluebell, which is a big lead mine situated across Kootenay Lake from Ainsworth. The Utica, 12 miles west of Kaslo, is shipping ore, and The Deep Mines, Ltd., is developing the deep of the Whitewater group properties, with the object of making tonnage available when concentrating and transportation facilities, destroyed by forest fires in 1910, shall have been replaced. Some 1,500 feet of underground work was done last year, including completion of a raise from the long cross-cut tunnel of The Deep mine, 540 feet to the old Whitewater Deep workings. A large fissure vein is being explored, and some ore has been found, but no great quantity has yet been blocked out. The outlook for this mine is encouraging.

Slocan.—Not having railway connection, production of zinc ore from the Lucky Jim was not practicable in 1911, so development work only was done; No. 6 level, 400 feet below No. 5, was driven 1,134 feet, entering the lime dike in which drifting in search of the zinc ore bodies is in progress. The Rambler-Cariboo opened shoots of silver-lead ore on each level at 900, 1,000, and 1,200-ft. depth, respectively, and is extending the 1,400-ft. level to find the same shoots; the concentrating plant is being removed down to a new mill site near the railway, which is in course of construction to provide transportation for this mine and the Lucky Jim. The development of much ore of good grade in the lower levels of the Rambler-Cariboo is considered to have a most important bearing on the future of the Slocan district. This having proved that ore continues to depth. The Washington was further developed; it has much lead-zinc ore in its workings. The Payne—which in earlier years yielded 50,000 tons of ore averaging 68 per cent. lead and 120 ozs. silver per ton, also containing 6,000 tons zinc blende—is having a cross-cut tunnel driven 3,300 feet to cut the vein at 675 feet below the lowest old level. Cody camp was active; shoots of silver-lead and zinc ore were found in the Noble Five, the Reco opened a new shoot of ore in virgin ground on No. 11 level, the Twilight also found ore in its No. 2 adit, the Sunset continued driving No. 8 level 1,600 feet to reach a long sheet of ore worked for 300 feet in length on higher levels, and the Surprise passed through good ore when raising from its adit level at 1,100-ft. depth to connect with the bottom of the old shaft 830 feet above. About Sandon, at the Ruth-Hope the upper levels have been extended, and a lower adit driven 800 feet, while more than 500 tons silver-lead ore has been shipped; the Richmond-Eureka has continued development and shipped about 2,300 tons; a new company has been organized to work the Slocan Star, on which old workings have been reopene and a deep-level adit is being driven to cut the vein i 2,300 feet at 630 feet below No. 5 level. Four Mil Creek mines are flourishing; the Standard has cut goo ore on No. 6 level, which is 190 feet vertically belo the big galena showing on No. 5, has constructed a aerial tramway 8,000 feet from the mine to mill sit near Slocan Lake, equipped a 100-ton concentratin mill, put in a water line and air compressor, and ha commenced production on a larger scale; the Silverto Mines, Ltd., has opened much ore on levels down t No. 7, connected by raises up to No. 4, found rich rub silver occurring freely in the ore, renovated the Wak field concentrating mill, and been making experimenta runs with one unit of the Elmore Vacuum Proces plant on zinc middlings from jigs; the Van-Roi, whic commenced concentrating at its new mill in March put about 30,000 tons of ore through the mill and mad two marketable products, namely, silver-lead and silve zinc concentrates. The British Columbia Copper Co bonded a gold property situated above Slocan Lake an commenced developing it. Many other mines in Sloca and Slocan City divisions were worked, as well a those above named. On the whole the outlook for th Slocan district is regarded as more promising than fo years, with the deep of the mines being opened and or of good grade and in considerable quantity being foun at depth, already demonstrated down to 1,400 feet, an with expectation that it will go deeper.

Nelson.—In this division further development of th Molly Gibson has been favorable and the outlook fo the mine much improved; it is owned by the Con solidated Company, which has put its mill in running order and increased the power available for minin purposes. No information has been received from th Granite-Poorman gold mine, in connection with whic some sensations were sprung on the public in 1911 b a local newspaper. The Wilcox, Yankee Girl, an Dundee, all in Ymir camp, of this division, wer worked; the Yankee Girl sent 1,350 tons of ore to th smeltery before it passed into the hands of a receiver it has since been acquired by Spokane men. Th Emerald, near Salmo, shipped nearly 2,000 tons of lea ore; in this district the Consolidated Co. bonded som claims on which there is a big surface showing of lea carbonate ore. The Queen opened its gold-bearing vei down to greater depth; the Nugget milled betwee 3,000 and 4,000 tons of gold ore having a gross value o $20 per ton; the Mother Lode proved its veins down t 500 feet depth and put in a modern 10-stamp gold mill and the Kootenay Belle and others were further de veloped. The Arlington and Second Relief, in Eri camp, were also producers of gold ore.

Rossland.—The chief developments here were in the Centre Star group, owned by the Consolidated Co., and the mines of Le Roi No. 2, Ltd. The former found the high-grade ore opened in the bottom of the War Eagle develop into quite a large body and the average grade to keep up beyond expectations. Smaller ore bodies were opened in other parts of the Centre Star group. The Le Roi No. 2 discovered and developed the Holy-well vein on the 300 and 500-ft. levels, and opened much ore in the Rodney vein on the 1,200-ft. level. The 1,300-ft. level was extended and preparations were made for going deeper, indications being in favor of finding more good ore in the deep. The Le Roi No. 2 shipped 27,000 tons of crude ore to the smeltery and concentrated 18,000 tons, producing 1,600 tons of gold-copper concentrate. The Le Roi was sold to the Consolidated

Co.; latterly it has been shipping 100 tons of ore a day, and an early increase in tonnage is looked for. The Bluebird and other small properties were also worked. At the Trail smeltery and lead refinery the Consolidated Co. put in two units of the Dwight-Lloyd sintering process plant, rearranged the Huntington-Heberlein plant, and made numerous changes to facilitate handling and sampling ore.

Other West Kootenay Divisions.—In Revelstoke division mining is largely restricted to development of mica deposits and hydraulicking for placer gold, both in Big Bend district. In the Lardeau, the Beatrice shipped 310 tons of ore, and in Trout Lake division the Silver Cup made an output of about 500 tons, also of silver-lead ore. Development was done on the Winslow, a gold claim, but there was little else worthy of note.

Boundary.—Tonnage of ore mined and smelted was the smallest in this district since 1907, due chiefly to the Crow's Nest miners' strike. The total was about 1,200,000 tons, as compared with 1,600,000 tons in 1910. The Granby Co.'s production was 583,000 tons as against 1,075,000 tons in 1910; the Snowshoe also produced less—31,000 tons as compared with 147,000 tons in 1910. On the other hand, the British Columbia Copper Co. increased its output 95,000 tons—533,000 as compared with 438,000 tons. Little development work was done in the Granby mines during the calendar year, for they were closed several months, but in the fiscal year, to June 30, last, estimated additional tonnage of ore blocked out was 1,248,000 tons, while only 957,000 tons were shipped, consequently ore in sight was increased 291,000 tons, making total ore "estimated in sight" 6,720,000 tons. Notwithstanding the reduced tonnage treated, smelting costs were three cents per ton lower. A new method for the disposal of slag, previously dumped molten, was arranged for while the furnaces were out of blast; this consists principally of granulation of the slag by water, sluicing of slag to central storage bins, where it will be dewatered, and conveyance of slag on conveyor belts up an incline to an elevation of 100 feet above the old dump and distribution there. Dump room for six to ten million tons of slag is thus provided. Most of the B. C. Copper Co.'s ore treated came from its Mother Lode mine, in which a different method of mining was adopted; the ore body was divided into a series of transverse stopes of a maximum width of 25 feet., thus making available a greater percentage of the ore and reducing costs of extracting it. Under this system more than 100,000 tons of ore was broken down at one time last autumn. In this connection 2,433 holes were drilled, averaging approximately 14 feet each in depth. These were charged with 425 boxes of 40 per cent. dynamite, equal to 10⅝ tons; 2,525 electric detonators, low tension, No. 7, were used connected in series of 25; connection was finally made to 550-volt current, and the whole exploded, breaking down tonnage stated above. The year's tonnage from the Mother Lode was about 315,000 tons; while from the New Dominion Copper Co.'s Rawhide mine 172,000 tons was obtained, and 46,000 tons from three other Boundary mines owned by the company. In addition, 15,000 tons from two mines in the neighboring State of Washington, also owned by this company, was smelted. Three furnaces were kept in blast nearly all the year, using Pennsylvania coke, until November, when one was blown out to economize in coke consumption, until a supply should be obtainable from Alberta. Work was resumed in the Emma mine after a long shut-down, and about 1,500 tons of ore shipped monthly to the smeltery. During the year several properties were bonded and exploration work done on them; among these was the Voigt group of 65 claims in Similkameen district, which it is hoped, will develop into big copper mine. The Greenwood-Phoenix Tramway Co. extended its adit to 3,000 feet from portal, and the Argo company also drove a long tunnel, but there was little else noteworthy.

Similkameen.—In metal mining the Hedley Gold Mining Co. was the only one that produced ore. The output from its Nickel Plate group of mines was approximately 57,000 tons, milled at its 40-stamp mill at Hedley, as compared with 46,800 tons in 1910. Average value per ton was $12.10 and percentage of extraction 92 per cent. This shows a recovered value four cents per ton higher than in 1910. No gold is saved on amalgamation plates, but about 75 per cent. of value recovered is by concentration, and 25 per cent. by cyanidation. Treatment process includes crushing by stamps, tube-milling, cyaniding, and saving of gold in Merrill standard 36-in. frame presses with Oliver filter presses for slimes. Production of concentrates is about 300 tons per month; the concentrate, which runs high in gold, is reduced at Tacoma smeltery, Washington. Development work done during year added largely to known reserves of ore. Lower levels of mine look well and prospects for 1912 are bright. Coal was shipped from a small colliery at Princeton, and a promising new coal mine was opened above Granite Creek, Tulameen.

Nicola.—Chief development was at coal mines. The Nicola Valley Coal and Coke Co. erected and equipped a new tipple, making coal handling capacity 1,000 tons per day; put in new machinery and plant; extended railway trackage; much improved outlets from mines, and found by means of diamond drilling important extensions of coal deposits. Output tonnage was in excess of 209,000 tons, as compared with 141,000 tons in 1910. Development of several other properties was continued, but production was small. A gypsum deposit was opened and shipments made from it. There was little mining worthy of mention done in other parts of Yale district.

Coast.—Quite a transformation has been effected in the Britannia mine, Howe Sound. Two years ago the outlook for this property was discouraging; now there is in sight a large tonnage of ore running 4 to 5 per cent. copper, and it is believed the development work of the early future will greatly increase known good ore in sight. More than 100,000 tons of ore was extracted; most of this was passed through the graded crushing and concentrating mill. Extraction was good for chalcopyrite ore—about 80 per cent. A full-sized working unit of the Elmore Vacuum Process plant gave excellent recoveries, indicating that treatment of fines and slimes, following hand-sorting and jigging, will bring total extraction of value up to a high percentage.

Another important advance made was that of the Granby Co., at its Hidden Creek copper mine, Observatory Inlet. Reports of six engineers show an estimate tonnage—minimum 6,000,000, maximum 12,000,000 tons, averaging two per cent. copper for the smaller and 1.65 per cent. for the larger tonnage. Since their examinations of the mine, further development has given additional tonnage estimated to include at least 200,000 tons of 5 per cent. copper ore, beside that of lower grade also developed. Company has had up to 270 men preparing mine for stoping and production, and carrying out surface improvements. Establishment at Goose Bay, near the mine, of a copper smeltery, with

blast furnace capacity of 2,000 tons per diem, is planned. The year's results in Portland Canal camp have been disappointing. The only mine that made production on a commercial basis was that of the Portland Canal Mining Co., from which ore was extracted that when concentrated in the company's mill gave rather more than 2,000 tons of concentrates, the bulk of which was a product running 12 to 15 ozs. silver and 7 to 11 per cent. lead. The year's results demonstrated that, to be profitable, milling operations must be on a much larger scale. The Red Cliff was reported to have developed much copper ore of good grade, but bulk shipments to smeltery, frequently talked of, were not made. Other properties were stated to be looking well, but they are without transportation facilities. In Skeena River district numerous silver-lead claims were more or less prospected; in some cases development into shipping mines is confidently expected. Most of these are within a radius of 20 miles of Hazelton. Railway transportation will likely be available for some of them in 1912. More work was done on coal properties in the Telkwa and Morrice River district, while in the northern part of Skeena district much anthracite coal was found and some development work done on it. This coal field is described as promising to prove extensive and valuable. Prospecting for coal and oil on Graham Island, of the Queen Charlotte group, was done by various holdings; little progress appears to have been made in connection with metal mining on these islands.

The Marble Bay mine, Texada Island, continued to produce much bornite ore containing copper in good average quantity and an appreciable additional value in gold and silver. The Cornell mine did not ship much ore in 1911. Metal mining was practically nonexistant on Vancouver Island, but substantial advance was made in coal mining during the year. The Western Fuel Company, Nanaimo, made the largest output in the history of its mines—about 586,000 long tons, as compared with nearly 513,000 tons in 1910. This company is opening a new shaft mine about 4 miles south of Nanaimo—main and air shafts are being sunk to a depth of about 1,000 feet, and it is expected coal will be reached next autumn. Thereafter the mine will be rapidly developed to a producing capacity of 1,200 to 1,500 tons a day. The company's mines are in excellent condition as regards equipment, development, and prospects, and it is expected 1912 will prove a record year. Distribution of coal produced was approximately as follows: Sold in British Columbia, 59 per cent., in California 32 per cent., elsewhere 9 per cent. The Canadian Collieries (Dunsmuir) Limited maintained production at about same rate as in 1910, when the output was nearly 900,000 long tons, of which 122,000 tons was exported to the United States, and 26,000 tons to other countries. The distribution of the 1911 production was somewhat similar. The company has let contracts for construction work in connection with the development of a hydro-electric water power, initial capacity to be 11,000 h.p. Work let includes dam and a waterline about three miles long. Power will be used at the company's several Union Colliery mines in the vicinity of Cumberland, Comox district. A new shaft mine is to be opened, but as the shaft, the sinking of which has been commenced, will have to be sunk about 1,000 feet, no production from here will be made until 12 or 18 months hence. Many changes and improvements have been authorized, and these are being carried out as rapidly as practicable. Production is to be materially increased and more of the company's large deposits of coal utilized. The Pacific Coast Coal Mines, Ltd., has increased production at its Fiddick colliery to about 20,000 tons a month, and has active demand for all the coal it mines. At its Suquash colliery, development is being continued to get the property in shape for shipping coal. The Vancouver-Nanaimo Coal Mining Co is providing shipping facilities at tidewater for the coal it mines at its New East Wellington colliery. Reverting to metal mining—the Tyee Copper Co.'s smeltery at Ladysmith, Vancouver Island, was operated intermittently during the year, but the available supply of ore was insufficient to keep its furnaces in blast continuously. The ore smelted came chiefly from British Columbia coastal mines, and others in southern Alaska.

Prospects for Future.—For metal mining the outlook is fairly encouraging. More gold and silver should be produced from Nelson, Rossland, Boundary, Similkameen, and Coast mines; silver and lead in larger quantity should be mined in Slocan district especially, and to a smaller degree in East Kootenay and Skeena district; coast mines promise a greater output of copper, but known inland mines will hardly make any increase; zinc production was so small in 1911 that it will not be difficult to make a considerable advance upon that. The utilization of iron ore deposits will likely be longer deferred. Coal promises to become increasingly important, and its production to soon reach a value in excess of that of all other mineral products of the province combined. Building materials and other nonmetallic minerals will also make steady advance. Metallurgical methods are being improved, and conditions generally indicate progress for the mining industry.

The Gypsum Deposits of Nova Scotia

(Continued from last issue).

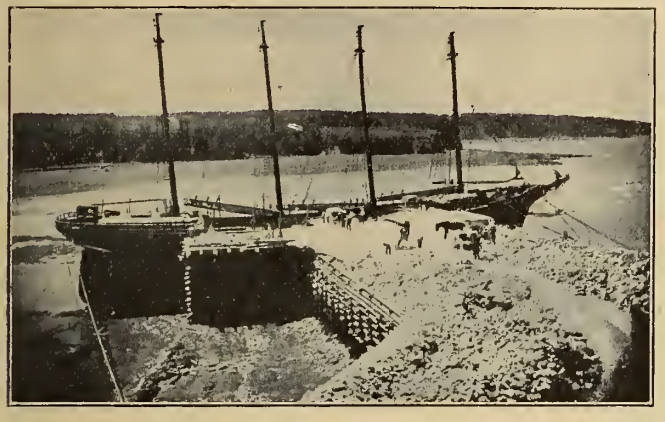
Sheet No. 42, Noel, Hants County.

This sheet, besides showing the continuation of the deposits of the Kennetcook Valley, where there are several important exposures of gypsum similar in quality and texture to those that have been described in this valley, also shows a northerly gypsiferous area belonging to the Windsor series. This branches off from the Kennetcook valley near Burton's, and follows a westwardly course skirting the older Devonian rock, to the Avon River on the west, and forms the northern boundary of the lower Carboniferous basin of Hants county.

In this section important exposures of all varieties occur. Many of them, however, being so far away from transportation facilities, are not considered commercially valuable. Among these may be mentioned

the deposits on the Petite River, those on the West Branch of the Tennycape River, on Robinson Brook, and those east of Northfield, together with those in an isolated area 1½ miles north of the Kennetcook River.

The first to be considered are those at Noel Lake. Here the gypsum outcrops on both sides of the lake and shows beneath the water in the lake. The greater part of the deposits appear as a white compact variety of excellent quality. In some places anhydrite occurs, in a form peculiar to this place, not in veins, masses, or beds, but in round spire-like pinnacles protruding through the gypsum.



Loading Gypsum at Walton Shipping pier.

On the west side of the lake the O'Brien Company has been operating for a few years, and exporting the crude rock to the United States. The quarry is situated in a hollow between 30 and 40 feet below the surrounding country, and has a height of face equal to that depth. It is drained by natural watercourses through the rock. The top of the rock is covered with blow or pipe holes. At the east of the lake, on the property of J. S. O'Brien, some development work has been done, which has proved the existence of large quantities of gypsum of excellent quality.

The present system of transporting this rock to the shipping pier (3½ miles distant) is by horses and wagons, which makes an excessive cost. A line of railway, over a very easy location, is proposed for future development, and, if constructed, will make this property one of the most desirable on the Minas Basin.

The next deposit of importance west of the above is one situated in the rear of Minasville, about 1½ miles from the shore. This property has an exposure averaging 50 feet in height, and over 1,500 feet in length. It is a good white compact variety of gypsum, showing but few irregularities. The topography of the country between the shore and the deposit is such that it would be difficult and expensive to construct a railway connecting the two points, but it has been proposed to make Tennycape harbour the shipping port, and build a railway to that point, a distance of 3½ miles.

Sheet No. 43, Walton, Hants County.

Following westwardly from No. 42 the gypsum can be traced almost continuously, by outcrops and other characteristics, the whole length of the gypsiferous area, which in this sheet consists of 33.7 square miles. The most important deposit is that at Walton which is shown in Plate I. It is one of the largest deposits in the country, having a face 100 feet high, and may be followed, with a constant exposure, for over 2,600 feet, and continues for miles with a series of extensive outcrops.

The Walton deposit, which has been operated intermittingly for nearly a century, is now producing from 40,000 to 50,000 tons annually. The rock is a greyish white and blue compact variety, showing comparatively small quantities of anhydrite occurring in lenticular veins surrounded by gypsum, graduating with increasing or diminishing prominence into each other. At this point the pipe or blow holes are very characteristic, having a circular area, with perpendicular walls and rounded bottoms. The rock, where excavated, has no covering of clay, and everything, except foreign material, that will not pass through a coke fork, is shipped. The deposit is situated 1 mile from the shipping pier and the rock is hauled there with horses and carts. At present the whole output is taken by Messrs. J. B. King & Co., of New York, and transported by this firm in its own barges.

Sheet No. 44, Cheverie, Hants County.

Cheverie, consisting of an area of 4.3 square miles, is situated on the south side of Minas Basin, about 6 miles east from the mouth of the Avon, and has good water transportation facilities. Here operations have been carried on intermittingly for many years. Outcrops occur at the shore, in high cliffs, associated with much anhydrite, and carbonate of lime in close contact. They also have prominence, and have been operated in the past, about a mile from the shore, where the rock appears to be freer from irregularities.

The present operations are carried on at the shore, at points known as the Cove quarry and the upper head. The Lower head occurs about one mile distant, on the north side of Cheverie Creek, in a small isolated area.

The Cove quarry is about 500 yards from the beach where the shipping pier is located. The gypsum is

Wentworth Gypsum Company's quarry; general view of quarry and transportation to pier.

covered with clay from 10 to 15 feet thick, and underlain with anhydrite. The gypsum and anhydrite graduate from one to the other without any particular line of demarcation.

On the right of this illustration is shown a tunnel, opened for underground mining and to develop deposits on the opposite side of the public highway, which runs near the face of the quarry. The Upper Head quarry is on the beach, a few hundred yards

east of the shipping pier. The high tides of the Bay of Fundy do the work of cleaning the quarry, by washing the debris away from the rock. This rock is principally anhydrite with some gypsum intermixed.

Sheet No. 45, Avon River, Hants County.

Total gypsiferous area, 70.56 square miles.

On both sides of the estuary of the Avon River extensive deposits of gypsum have been known since the early discovery of the country, and some of them were operated over a century ago. Beginning at Summerville, on the east side, and Mount Denson on the west side, and continuing up the river for a distance of 8 to 10 miles, or until it meets with the irruptive rocks of the Ardoise hills, is the width here of the lower Carboniferous measures in which the gypsum deposits occur. These measures, which extend eastwardly, and are described in the opening of this chapter, carry, almost without interruption, gypsum deposits as far as the Shubenacadie River.

Many of the operations of the past in this section have been, for various reasons, abandoned. Few have made any attempt to operate below drainage level, and water has driven them out. Many of these deposits

Wentworth Gypsum Company's loading Stage for Cars.

have an overburden of clay, and owing to its increasing thickness, became too expensive to operate under existing circumstances; in others the prevalence of anhydrite has been discouraging, and concentration of trade has had much to do with closing out small operators; but not even in the quarries with the oldest history can it be said that the gypsum became exhausted.

Starting again at the northwest angle of this sheet, near Summerville, there is an area on the east side of the Avon, which by erosion of the river bank has been divided from the main body. It is known as Grant's quarry, and was operated for many years, but, although situated within a few hundred yards of the shipping pier, the rock dipping eastwardly under a heavy overburden of clay made operations too expensive, and the place has been abandoned. The rock here was a very fine white compact variety, showing a few streaks of black irregularly distributed through the white. The black was high in carbonate of magnesia, and carried some bitumen and iron pyrites.

A short distance above Summerville occurs the next outcrop, from which a small quantity has been taken. It has a small area, and is of little importance.

On the west side of the river, a few miles farther south, at Mount Denson, extensive cliffs 40 to 60 feet in height occur on the banks of the river and extend out on the beach to the river bottom. The greater part of the exposure here appears as anhydrite, but much of the concealed measures show evidence of a softer rock, and part of the rock on the beach is an excellent variety of gypsum, white, with a fine compact structure.

Prominent outcrops are also seen on the Scott estate and on the Hannah property, between the shore and the main road leading to Windsor. At the former place is one of the old quarries which was operated many years ago. It has a face exposed from 50 feet downwards, and much of it is white and blue gypsum, of a good variety, but associated with considerable anhydrite. On the Hannah property the principal outcrops are anhydrite. West of this property, about 1 mile from the shore, at the Duck pond, an extensive exposure is seen, from 40 to 60 feet in height. Much of the rock is harder than that allowed by the scale of hardness, yet in composition it is a true gypsum, white and compact. At Lower Falmouth there is a prominent exposure in the old quarry at Young's, and continuing on to Falmouth many outcrops occur. The most extensive is on the Glebe property, situated about 1½ miles from the western shores of the Avon River, opposite Windsor. Here the gypsum exposures have an average height above drainage level of 55 feet, and cover an area of several acres. Easy gradients could be secured from the deposit to the shipping point, and this, with a good white and grey compact rock showing but few irregularities, gives commercial value to the property. Continuing southwardly from the above, the outcrops are again met with on the Hanson property, but the gypsum, especially that occurring in lower ground, is irregular in colour and texture. This is another abandoned quarry.

Crossing the Avon River to Windsor on the east side we are on the historic ground of the gypsum industry of this Province. Here the gypsum beds lie almost parallel, having a strike east and west, the northern and southern boundaries converging slightly as they near the Kennetcook valley on the east. The greatest distance across the strike is about 6 miles. The most southern operations are those of the Wentworth Gypsum Company, at Meadow quarry, while the most northern are those of the Newport Plaster Mining and Development Co., Ltd., at Avondale.

One and a quarter miles south of Windsor there are what were known as the Wilkins and Redden quarries, long since closed, except for small quantities now being used for calcining purposes by the Windsor Plaster Company.

Beginning with the operations on the southern beds, the first is the Nova Scotia Gypsum Company quarry, at Threemile plains. This is situated about 3½ miles from Windsor, near the Dominion Atlantic Railway Company's line, on which the rock is transported to Windsor for export purposes. The rock is an excellent white, compact variety, having a working face 30 feet in height above drainage level; but it has a heavy overburden of clay, averaging 30 feet in thickness. This is considered the extreme limit of clay that can be moved profitably by the present methods of operating; that is, 1 foot of clay to 1 foot of face. An attempt was made to mine this rock, but sufficient height of face could not be secured without the use of pumps to make it an economic proposition.

South of this, about half a mile, is the Meadow arry, owned and operated by the Wentworth Gyp- m Company. Here the rock has no covering of clay. ie surface is very uneven, being covered with kettle, pe, or blow holes, and as usual, where the gypsum free from covering, the first few feet of the exposed rface is badly disintegrated by atmospheric action. a the eastern side of the quarry the face is 75 feet height, extending westward and gradually dimin- hing in height; it also shows a natural water course cave near the bottom. These beds are practically rizontal, and slightly stratified.

This quarry is connected with the Dominion Atlantic ailway by a branch road about one mile in length. ipments are made over it to Windsor (4 miles) in mmer, and occasionally to Halifax (41 miles) in the inter season.

The next property, 1½ miles east of the above, is ie quarry of the Windsor Gypsum Company at New- rt. The occurrence and the conditions under which is operated are very similar to those of the Nova otia Gypsum Company above described, except that

East of this, at Newport, there are a few other deposits which in the past have been operated and are now closed, but they are of no particular importance, and so similar in quality to those described that it is not necessary to give a detailed description of each outcrop.

North of the above described quarries, between 1 and 2 miles, occurs the second series of parallel gypsum beds. The principal operations are on the Wentworth deposit, owned and operated by the Wentworth Gypsum Company. From here the largest exporting business of the Province is carried on. This trade in 1868 amounted to 10,000 tons, while in 1909 it exceeded 175,000 tons. The deposits are very extensive, the Company owning about 1,200 acres, all underlaid with gypsum. The rock is principally a white compact variety, well suited for all manufacturing purposes. Anhydrite occurs irregularly, in some parts in prominent exposures, in others beneath the floor of the quarries. The greater part is covered by a heavy overburden of clay, in some places from 25 to 30 feet thick, but it has an advantage over the southern

Wentworth Gypsum Company. Loading gypsum into barges.

he operations are much more extensive. The superior uality of the rock in both these places is the only ircumstance that makes it possible to operate under xisting conditions. This property is also connected vith the Dominion Atlantic Railway, over which the rude rock is hauled to Windsor for water transporta- ion to the United States.

A feature of considerable geological interest occurs ere, which would warrant more complete investiga- ion if time permitted. Within a distance of 2 miles, n the same strike and having a similar elevation bove the sea-level, three exposures are seen. Two of these, one on either end, have been planed off by glacial action to practically an even surface, and cov- ered with a heavy overburden of boulder clay, while the centre one is quite free from clay, and does not show the same glacial action, nor any overburden of clay.

deposits in having a higher working face beneath the clay.

In the past all this clay was brought down with the gypsum and removed by horses and carts to the waste dump. At present the steam shovel is being used in some places to remove the clay from the top, before the rock is blasted.

These quarries are connected by a standard gauge steam railway with the shipping piers, 2½ miles distant, on the St. Croix River, which is a tributary of the Avon.

After the rock is blasted and broken to one man size (meaning the size one man can conveniently handle), it is put in carts and hauled to a loading stage sufficiently high to dump directly into cars. It is then taken by train to the shipping pier and loaded into barges which are dismantled schooners of about 2,000 to 2,500 tons capacity, and towed to New York.

INDEX
MAP OF
PART OF
THE PROVINCE OF
NOVA SCOTIA
Showing distribution of occurrences
of Gypsum
Scale of Miles
NEW BRUNSWICK
Baie Verte
Cape North
Aspy Bay
Cape Egmont
Kignecto Bay
AMHERST
JOGGINS
MACCAN
SPRINGHILL JCT.
CUMBERLAND RAILWAY & COAL CO.
OXFORD JCT.
INTERCOLONIAL
PARRSBORO
Minas Channel
Minas Basin
NORTHUMBERLAND STRAIT
PICTOU I.
PICTOU
Pictou Harbour
Cobequid Bay
DOMINION ATLANTIC RAILWAY
TRURO
NEW GLASGOW
Cape George
GEORGE BAY
Antigonish Harbour
ANTIGONISH
WINDSOR
CHETICAMP
GRAND ETANG
INVERNESS
North Bay
South Bay
St Ann Bay
Great Bras Dor
Little Bras Dor
Sydney Harbour
Little Bras Dor Lake
SYDNEY
GLACE BAY
Great Bras Dor Lake
East Bay
West Bay
PORT MULGRAVE
Port Morien
Mira Bay
LOUISBURG
Scatari I.
C. Cape Breton
Gabarus Bay
Cape Gabarus
Madame I.
GUYSBOROUGH
Chedabucto Bay
Cape Canso
LUNENBURG
Mahone Bay
HALIFAX
Lunenburg Bay
Halifax Harbour
Cole Harbour
Cape Sambro
Tedidare Harbour
Sheet Harbour
Indian Harbour
Country Harbour
Tor Bay
ATLANTIC OCEAN
LEGEND
Outline of Gypsum Monograph Sheets
Boundaries of Lower Carboniferous Areas
Gypsum Deposits
Coal Mines
Railway
No 64

generally three in a tow. These barges are usually taken out singly, at high tide on the Avon, and anchored in head water of the Minas Basin, where the whole tow is made up and taken by an ocean going tug. The whole product of these quarries is taken exclusively by Messrs. J. B. King and Company, who have extensive mills on Staten Island. This firm is also a large holder in the Wentworth Gypsum Company.

East of the Wentworth Gypsum Company property, and adjoining it, is the Phillips farm. It has an area of 75 acres, and an average elevation above drainage level of 60 feet. It was tested in 1909 by a series of trenches and pits, and showed an excellent variety of white and snow-white gypsum of fine compact structure, the greater part being covered with clay; showing in the pits and trenches from 2 to 15 feet deep.

The proposed shipping point for this deposit is on the St. Croix River, above the railway bridge. This bridge is fitted with a draw having a width of 32 feet.

Above the St. Croix public bridge and east of the last described property, high prominent cliffs of gypsum and anhydrite are seen, and from here back to Newport station occurs an almost continuous series of outcrops, but the greater part of them show anhydrite in abundance. Above the St. Croix bridge, 30 or 40 years ago, gypsum was quarried and scowed down the river for export purposes.

Again, farther east on the Meander River, gypsum was quarried on the Woolaver property, and on the Chambers property. On the latter, prominent exposures are now seen of white and blue gypsum, of both granular and compact texture. The operations were carried on here many years ago, when the transportation was done in small vessels which loaded near the old shipyard.

Going north from the Wentworth quarries to the third range of gypsum beds, the principal operations are carried on at Avondale by the Newport Plaster Mining and Development Company, Ltd. (Messrs. J. B. King & Co., of New York, being the principal holders). This company controls about 4,000 acres of gypsum land in this vicinity, and is preparing for extensive operations. The old quarry, which was operated here some years ago, has been reopened at a lower level, by driving a tunnel large enough for drainage and railway track. This will lower the floor of the quarry from 10 to 20 feet. They also extended their operations west about 2½ miles, where they are opening up a new quarry, and connecting it with their shipping pier by a standard gauge railway, now under construction.

The rock is principally white in colour, with some little grey and black. Portions of it show an excess of carbonate of lime.

On the eastern extremity of this Company's property are the old quarries at Miller Creek, which were abandoned many years ago, but likely to be reopened by this company.

Continuing eastwardly, prominent exposures occur on the west side of River Hebert, near the railway, and on the Chambers property on the east side. Here considerable anhydrite is in evidence, but some very superior snow-white gypsum is seen on the Chambers properties.

The exposures at this latter point are low, but the rising ground going east gives evidence of large quantities covered with clay.

GYPSUM DISTRICT "F."

Sheet No. 32, Malagash, Cumberland County.

Near the eastern extremity of the Clairmont anticline is a gypsiferous area of 2.19 square miles. In this several important outcrops of gypsum occur. On the shore of Plaster Cove, East Wallace, on the road leading to Wallace and eastwardly to North Shore, Malagash, the beds can be followed almost continuously, associated with greenish yellow marls, clay, and limestone. The rock is white, with compact crystallization. The location of these deposits, so easily accessible to water transportation by the Gulf of St. Lawrence, and having the Pictou coal fields on the east, and the Cumberland coal field, 35 miles distant by rail, on the west, makes it one of the most desirable in the district for supplying the Canadian markets, either with the crude or manufactured article.

Sheet No. 33, Pugwash, Cumberland County.

Following the Clairmont anticline westwardly we again have important outcrops of gypsum near Hartford, associated with the limestones; at Canfield Creek, a tributary to the Pugwash River, and 4 miles from its mouth; and also—principally in concealed measures—on the east and west side of the Pugwash River basin, and on Victoria Island in the basin. This whole basin evidently was at one time a calcareous formation.

The most interesting part of this section is that of Canfield Creek. Here the grey, greyish white, and white gypsum outcrop in extensive beds. They are within 2½ miles of railway, and if connected, it would place them within 5 miles of deep water shipping.

At the northern base of the gypsum outcrops, in a shallow basin of water, at the water's edge, the largest and purest deposit of selenite known has been discovered.

Analyses of the samples taken from Canfield creek show the following results:—

	Per cent.
Lime	33.25
Ferric oxide and alumina	0.74
Sulphuric anhydride	42.76
Carbonic anhydride	3.11
Water, loss on ignition	19.30
Insoluble mineral matter	1.72
	100.88

No. I. Sample from old quarry, greyish white in colour and slaty structure. This rock is being used in the manufacture of fertilizer at Pugwash.

Sheet No. 36, Nappan, Cumberland County.

About 1 mile north of Nappan station, and extending westwardly to Cumberland Basin, occur outcrops of importance, in a gypsiferous area traceable over 800 acres. The topography of the country is low, consisting principally of marsh or dike lands, which makes it difficult to trace boundaries. The exposures are known as the Newcombe, the Fowler, and those operated by the Maritime Gypsum Company, Limited, which cover an area of 12 acres. This company has been operating for several years, shipping an average of 4,000 tons per year. Their operations have been carried on below the drainage level, in an open pit to a depth of 50 feet below the fractured surface, and they have tested the ground by bore holes to a depth of 100 feet. During the summer of 1909 they installed a Ledgerwood cable system, and are prepared to sink to a further depth. This property is connected with the Intercolonial railway by a branch line, which also

connects with their shipping pier, at tidewater, on the Cumberland Basin, 2½ miles from the quarry.

The rock at the surface is considerably fractured, and is mixed somewhat with clay and thin seams of dark carbonaceous material, but at depth it is white, compact, and very pure.

THE REA MINE, PORCUPINE

Written for the Canadian Mining Journal by
T. H. REA.

[Editor's Note:—There are two ways in which stock jobbers may injure the mining industry. Undue inflation is the usual method. Another, more insidious, and often quite as damaging, is the circulation of anonymous newspaper items that are designed to discredit any given mine. The object of such rumours is too obvious to require any explanation.

Just after a representative of the Canadian Mining Journal had paid a visit to the Rea mine in Porcupine, an incident occurred that led him to request Mr. T. H. Rea, a director of the Rea Consolidated Gold mines, Limited, to write the following article. The Journal has first-hand knowledge of the Rea mine and has no hesitation in describing Mr. Rea's statements as substantially correct. As stated above, this article was written at the specific request of The Canadian Mining Journal, and is intended to clear up misapprehensions as to the standing of the property.]

General View of the Rea Mine.

This property consists of 321 acres, comprising the north half of lots 6 and 7, concession No. 3, Tisdale township.

A patent from the Ontario Government for the north half of lot 6 was issued to one Homer on September 25th, 1907, and a patent to one Martin for lot 7 was issued on January 9th, 1908.

Mr. Cavanagh, of Orillia, Ont., purchased these veteran lots from Homer and Martin before Porcupine was discovered. It was not until Mr. F. M. Connell, of Kingston, Ont., had acquired the property in May, 1910, that the main, or No. 1, vein was discovered. Mr. Connell uncovered this vein over a distance of 205 feet. Native gold was observable along the vein for a distance of 150 feet, showing along the northwest wall in the quartz from one to five feet from that wall. The wall itself shows gold in places where it is vertically grooved.

Measurements of the width of the vein, made by Mr. Louis Webb and myself, gave an average width of six feet. Sampled every five feet, for a stoping width of 42 inches, it gave an average assay of $23.05 per ton.

On August 18th, 1910, I bought the property from Mr. Connell, and on September 22nd, 1910, I commenced sinking two prospect shafts on the northwest wall, 150 feet apart. On October 25th, 1910, these shafts had reached a depth of 27 feet. Meanwhile I gave Mr. H. H. Webb, consulting mining engineer and attorney-in-fact for the Consolidated Gold Fields of South Africa, an option on a three-fifths interest. After he had examined the property in the latter part of October he sent Mr. Louis Webb, his assistant, to sample it thoroughly. At the same time he engaged Mr. Harold Kingsmill and instructed him to order machinery and to sink the east, or Kingsmill, shaft 200 feet. Mr. Kingsmill was also instructed to commence sinking No. 2 shaft on the No. 3 vein on the

east lot to the distance of 100 feet, and also to commence diamond drilling. Mr. Louis Webb sampled both shafts on Vein No. 1, allowing a stoping width of 42 inches. The average in the Kingsmill shaft was $47.50 per ton, and on the west, or Eakins shaft, $26 per ton.

A shot-drill was used to prove the vertical continuity of the vein. At a point 70 feet northwest of the Kingsmill shaft a hole was put down at an angle of 78 degrees, cutting the vein at 228 feet, vertical depth, and cross-cutting 11 feet of quartz, making a total depth of 239 feet. Four and one-half feet of quartz on the footwall side of the vein at this point gave an average of $19.20 per ton. This did not include about 8 inches of the core containing visible gold.

The Kingsmill shaft had reached a depth of 70 feet at the time this vein was cut. Mr. Webb now gave orders for a complete plant, which consisted of one six-drill compressor, two 60-h.p. boilers, hoisting engine, and eight months' supplies. Suitable camp buildings were to be erected, etc.

After the machinery had been installed and supplies delivered, and about 50 per cent. of the payments made on the option, a disagreement arose between the parties interested in the option. This would have resulted in closing down the development work and the option would have been forfeited. However, I succeeded in arranging matters by taking back the option and reimbursing the Gold Fields and others their payments and expenditure on the property.

I then negotiated a deal with Mr. Henry Lockhart, president and general manager of the Mines Finance Co., New York, who incorporated the Rea Consolidated Gold Mines, Ltd., with a capital of $1,000,000, divided into 200,000 shares of $5 each. $70,000, which sum had been expended on the property, was paid; 100,000 capital stock was reserved; and $100,000 cash placed in the treasury.

Mr. Lockhart then sold to a Canadian underwriting syndicate a large block of stock, which was placed on the market by the syndicate. The first board of directors which consisted mainly of the underwriting syndicate, made a contract with the Bewick-Moreing Company to manage the property for three years. After the organization of the company they elected the present board of directors, and promptly withdrew their support from the market.

After Mr. Louis Webb's offer of his services as consulting engineer had been declined, and the contract made with the Bewick-Moreing Company, the Gold Fields and Mr. Lockhart sold a large portion of their shares. At this time the vein had been cross-cut on the 200-foot level, showing a width of 3 feet at the point of cross-cutting. Drifts northwest and southeast exposed the pay-shoot over a distance of 200 feet, and samples taken across the vein, every 5 feet, over a section 110 feet long, gave an average of $23.12. The entire length of the vein gave an average of over $18. Over one separate section of 50 feet the average assays were $37.83 per ton. This figure does not include a rich portion of the vein, about 15 feet, which swung to the south and left the footwall. This portion, in my opinion, if sampled, would bring the average up very considerably.

General View of the Rea Mine

The Kingsmill shaft has now reached a depth of 330 feet, including the sump. Thirty-five feet north of the 300-foot level the vein was intersected by a cross-cut. The vein on this level shows a width of 38 feet. A few samples were taken and assayed before Mr. O. H. Bergstrom, the present manager, was appointed. These showed low values. The values at this point are, no doubt, scattered, owing to the enlargement of the vein. The sampling done, however, was too meagre to show anything except that the samples themselves were low grade.

Mr. Bergstrom's first recommendation was to instal an assay office and testing plant, and, next, to drift northwest and southeast on the vein to permit of thorough sampling. This is being done.

Mr. Bergstrom is re-sampling the whole mine and both assaying and testing the ore to determine the method of milling.

The new vein recently discovered west of the power-house, showing visible gold, has been stripped at different points for 700 or 800 feet, and shaft-sinking has commenced. No. 3 vein, where the Gold Fields Company commenced prospecting with a core drill, and stopped on account of a break in the drill, will be sampled and sunk on. Surface stripping on this vein has uncovered at least two rich shoots.

Owing to the hoisting engine at the Kingsmill shaft being too small for work below the 300-foot level, Mr. Bergstrom has ordered a larger hoist, and will continu sinking to the 400-foot level.

The company has supplies on the property for si months in advance, a cash balance in hand of betwee $30,000 and $40,000, 100,000 shares in the treasur and, on short notice, sufficient cash will be provide to meet the cost of erecting and equipping a mill. I fact, the position of the company for all futur development is strong. The company's policy is t develop ore reserves and not to manipulate its stoc

THE HIGH DUTY GRAVITY STAMP MILL

(Abstract compiled for the Canadian Mining Journal.)

The Chemical, Metallurgical and Mining Society of South Africa is a body that displays exemplary care in adding to its membership, and a praiseworthy liberality in the scope of the papers that it accepts. At the October meeting of the society a paper was read by Mr. Peter N. Nissen, whom our readers will remember as the inventor of the Nissen stamp-mill. It is creditable to the spirit of the Society that an inventor should be permitted to present fully the claims and special merits of his invention.

As Mr. Nissen's paper is essentially an outline of the principles of high-duty gravity stamping, we shall glance over the leading features of his thesis.

Stating first that the gravity stamp has been found, within prescribed limits, to be the best device for crushing gold ores, Mr. Nissen points out that the function of the stamp is to crush the greatest quantity of ore for a given expenditure of power. He then alludes to his belief that all the stamps in a multiple stamp mortar cannot do the same amount of useful work. The lack of control of feed lessens efficiency and increases breakages and wear. The rectangular mortar is not logical, as only the material adjacent to the screen can be discharged. Double-discharge mortars do not improve this condition since they introduce fresh difficulties in feeding.

It is commercially impossible to make the multiple stamp mortar of sufficient weight to secure the necessary inertia for effective crushing. Therefore it must be attached rigidly to a foundation of great weight and stability. The greater the length of the mortar the more difficult is it to hold securely.

Stamps weighing above 1,250 lbs. carry in all cases shoes and dies of the same diameter, so that the length of the mortar need not be increased. This implies that any increase of weight must be obtained by using longer heads and heavier tappets. This has the evil effect of raising the centre of gravity and increasing the distance between the face of the die another lower guide. The more rational method of increasing the diameter of the head involves a longer and heavier mortar, and a greater distance between cam-shaft bearings, both of which factors are closely limited by practical considerations.

Now the heavy stamp, other things being equal, is more to be desired than the light stamp. It is claimed for the Nissen stamp that great crushing capacity has been secured with due regard for sound mechanical principles. Without signifying our own opinion, it will be instructive to follow Mr. Nissen's reasoning. In a later issue we shall summarize the criticisms volunteered by his fellow members, many of whom rank among the highest authorities on milling.

The Nissen stamp-mill has been developed on th unit principle. A circular mortar is provided for eac stamp. The height of discharge does not diffe materially from that obtaining in ordinary practice but, since the mortar is circular, the screen can b extended more than half way round, always at th same distance from the stamp. Thus a maximu screen area per stamp is secured and the screen i always at right angles to the splash of the pulp, instea of having the pulp impinge at all angles. Hence a particles that are sufficiently reduced are discharge rapidly. The circular design of the mortar, moreove induces the return of all uncrushed material to th die when the stamp is raised.

Each stamp controls automatically the feed into it own mortar. Certain mechanical advantages, alsc inhere in the circular design, such as the easy remova of shoes and dies, the reduction of the height of th battery structure, etc.

Although light, the Nissen mortar is very rigid, a it receives the blow of the stamp always in its vertica axis. Rocking strains are done away with, and ther is much less danger from shrinkage strains in th mortar casting. More continuous operations, slighte loss of time in repairs, greater strength of design, lowe centre of gravity, are some of the other advantage claimed. With large installations of Nissen stamps i has been found feasible to obtain an actual operatio of more than 95 per cent. of the total time.

An important feature in actual working is the even flat wear of the dies, which permits of discarding onl a minimum of metal. The head, which is a most im portant member, can, in the Nissen stamp, be mad very large in diameter, and, consequently, short. Thi is beneficial in more than one respect. The combine weight of the shoe and head is 57½ per cent of th total weight of a 2,000-lb. stamp. Thus the greate part of the weight is concentrated in the head, and no in the stem. A stem 5 inches in diameter by 10 feet i length, of double fagotted iron, is used. This can b made heavier without evil effect. Stem breakages ar thus practically eliminated. The tappet is made light broad faced, and short. The cam shaft is 6½ inche in diameter. The cams are arranged right and lef alternately on each pair of stamps, thus bringing then close to the bearings. The shaft in lifting four Nisse stamps transmits only about half the power necessar for the ten stamps in multiple mortar construc tion. As it is subject, moreover, to only 40 per cent. o the shocks, it has a much longer life.

The Nissen stamp for the same tonnage require about 30 per cent. less power than the ordinary stamp

herefore smaller motors, shafting, pulleys, and belting re used. The greater capacity obtained reduces the otal weight of the battery for a given tonnage of ore y possibly as much as 40 per cent. The dropping eight of the Nissen has gradually been increased to maximum of 2,250 lbs., and may be further added to. Exhaustive simultaneous tests carried out at the orks of the City Deep, Limited, with a view to comaring the performance of four Nissens with that of en City Deep stamps resulted most favourably for the Nissens. The running weights of the Nissen stamps aried from 1,927 lb. in test No. 2, to 2,245 lb. in test No. 3. The weights of the City Deep stamps ranged rom 1,775 lb. to 1,863 each. The number of drops for ne Nissen was 103 per minute; for the City Deep, 100. he height of the Nissen drop was 8½ inches, except n No. 3 test, when it was 8¾ inches. The City Deep rop was the same. The height of discharge varied rom 2 inches to 2⅝ inches for the Nissen, and from ¼ inches to 2½ inches for the City Deep. The screens sed by both were equivalent to nine holes per square nch, except in tests No. 3 and No. 6, when ⅜-inch pertures were used.

The following table compares the performance of oth:—

	Nissen. Tons.	City Deep. Tons.
Stamp duty per day (9-mesh screen)	24.47 to 30.85	18.26 to 20.95
Stamp duty per day (⅜-inch screen)	36.69 to 37.74	22.72 to 24.34
	H.P. hours	H.P. hours.
Power consumption per ton of ore crushed	2.7 to 4	4.45 to 5.5
	Lbs.	Lbs.
Ore crushed per lb. falling wt.	25.35 to 37.91	19.6 to 27.65

The wear and tear of shoes and dies is slightly in favour of the Nissen stamp. While the grade of the discharge was approximately the same in both cases, the feed to the Nissen was, with the exception of one experiment, always the coarser. The mechanical efficiency was 35 per cent. in favour of the Nissen.

Here follows a long comparative hypothetical statement of the cost, capacity, power demand, and wear for Nissen and ordinary stamps, which is again in favour of the Nissen.

It is worthy of note that six tests carried on at the City Deep were supervised by Messrs. F. L. Bosqui and J. H. Rider.

RHODESIAN WORKING COSTS

[Editor's Note.—We reprint hereunder an article illed from the Financial Times, London, England. As is a study of working costs in a very progressive gold ining country, it will prove interesting to Canadian perators. The mines referred to have not the benefit cheap electric power, and have to pay high prices r coal. The cost figures given are, naturally, shillings nd pence.]

(From a Correspondent.)

"Ajax," in contrasting the market valuations of the am and Motor and Eileen Alannah in a letter which ppeared in The Financial Times on Saturday last, entions that the working costs estimated for these ines (Cam and Motor, 23s per ton; Eileen Alannah, s per ton) "both seem low as compared with other hodesian costs." In taking this view, I fancy he is xpressing an opinion very generally held in the Stock xchange amongst those who follow the doings of hodesian mines. It is clear from Mr. Gerald Browne's port on the Cam and Motor, and Mr. Ackerman's port on the Eileen Alannah, that the ore bodies are entical, being—a short distance from the surface—friactory and "heavily mineralized with arsenical yrites." This, Mr. Ackerman agrees with other engineers, will necessitate roasting the whole of the ore, more complicated and expensive process than the ual milling and cyaniding treatment. The operations e set out by Mr. Gerald Browne as consisting of (1) ck-breaking (two steps), (2) rotary drying, (3) ball illing, (4) roasting, (5) tube milling, (6) slimes filtering, and (7) precipitation and smelting. The working sts for the Cam and Motor Mr. Gerald Browne places 30s per ton, which agrees with Mr. V. S. Allen's timate in his report published with the prospectus. is figure was adopted in all profit calculations for e Cam and Motor until the directors' annual report peared last month, when the profit in sight was revised on the basis of 23s per ton costs—a new estimate, given by Mr. G. F. Dickson on behalf of the London and Rhodesian Mining and Land Company, Limited, which acts as "the consulting engineers," and, as is known, was one of the promoters. No reason was given for thus suddenly lopping 7s per ton, or 30 per cent., off the estimated working costs arrived at by two independent engineers. It is certainly a matter that seems to call for explanation. Such a reduction, of course, makes a great difference in the theoretical "profit in sight," increasing it on the 700,000 tons reported to be exposed by no less than £245,000.

Mr. Ackerman, in his report on the Eileen Alannah, however, believes that the costs will be still lower. He puts them at 17s 6d per ton on the basis of 6,000 tons treated per month, with an additional 2s per ton for roasting the whole of the ore, or a total of 19s 6d per ton. In his final calculations of profit he assumes 19s per ton. Whether this includes the royalty of about 1s 6d per ton payable to the Chartered Company on the expected recovery of 49s per ton is not clear; presumably it does not.

At present there is no mine in Rhodesia roasting the whole of its ore, although it is expected by experts that several of the new properties being developed will be compelled to do so. The Globe and Phoenix is today merely roasting its rich concentrates, which are separated at an early stage from the crushed product. For the six months ended the 30th June last it thus treated 1,718 tons of concentrates—the current concentrates representing less than 5 per cent. of the total ore crushed the final result—with which shareholders equivalent to 1s 2d per ton on the total tonnage crushed. The alternative plan of roasting the whole of the ore treated, instead of only 5 per cent., will, of course, be more expensive. The roasting process, when dealing with large quantities, before the extrac-

tion of the concentrates, will naturally take less time and give a lower cost per ton of product roasted; on the other hand, in the aggregate more fuel and handling will be required, so that on the basis of the total ore crushed the final result—with which shareholders are concerned—will be that the working costs per ton will be higher. A point to be borne in mind is that coal, so essential for roasting, unless wood is cheap, is very expensive in Rhodesia, the price being three times as much as it is on the Rand.

Having regard to the estimated costs, roasting all the ore, of 23s per ton for the Cam and Motor and 19s per ton for the Eileen Alannah, it is interesting to observe that the mine working expenses of the Globe and Phoenix for the six months ended 30th June, 1911, roasting only 5 per cent. of its ore, were as high as 33s 3d per ton. The last annual report shows that the London charges amount to another 6s 10d, thus giving total costs of about 40s per ton, leaving such items as depreciation, income tax, etc., entirely out of account.

The Globe and Phoenix, the premier mine of Rhodesia, besides being a rich concern with years of experiences behind its back, is recognized to be capably managed. Judging by Rhodesian standards, its plant is by no means a small one, capable of treating, as it is, over 6,000 tons per month. Consequently it will be extraordinary—making every allowance for differences in mining conditions—if the Eileen Alannah or Cam and Motor can work at a figure so much below the costs prevailing at the Globe and Phoenix. Either there is undue optimism on one side or bad management on the other—which latter I, for one, am not prepared to believe.

Neither must it be lost sight of that, owing to the shortage of supply, coupled with increasing demand, native wages in Rhodesia are steadily rising, the minimum recruiting wage for certain classes of work having recently been advanced as much as 33 per cent. This must tend to increase rather than reduce the operating expenses of new mines, and must be allowed for in making estimates for the future.

Judged also by the standard of working costs of other crushing mines in Rhodesia—none of which, as far as I am aware, roast their ore—the Cam and Motor and Eileen Alannah estimates appear to be very low.

To arrive at the total of Rhodesian mining costs, it is necessary to add to the mine figures declared monthly or quarterly an estimate for London charges (including directors' fees) and other items, to be found only in the last annual reports and accounts. Here is an interesting table giving roughly the average mine cost for the last six months, plus an estimate of the "other charges" as they appear in the last published annual reports. Under the heading of other charges are also included depreciation and interest (variable quantities) when they appear in the reports, as these items have to be deducted from the mine profits before dividends can be paid:—

Company.	Monthly tonnage about.	Mine costs per ton.	London and other charges per ton.	Total cost per ton.
Bucks Reef	900	46/6	3/2	48/8
Charterland & G (Old Nic)	1,400	25/2	..	..
Eldorado	7,400	22/	3/10	25/10
Gaika	3,000	22/7	4/7	27/2
Giant	11,600	13/6	3/4	16/10
Globe	6,000	33/3	6/10	40/1
Jumbo	3,500	26/	8/6	34/6
Lonely	3,300	..	..	32/8
Rezendo	3,600	21/3	4/1	25/9
Penbalonga	5,800	20/8	3/9	24/5
Selukwe Col.	3,000	33/	3/6	36/6
Thistle Etna	3,000	26/9	3/9	29/6

The Lonely costs, being in respect of a new plan will no doubt be reduced. The Giant works an enormously wide reef.

An important item in Rhodesian mining costs, which is apt to "hide its light under a bushel," is the royalty payable to the Chartered Company, where such has not been compounded. It is reckoned on the gold won not on the profit earned. Last year with the Bue reef it was 8s per ton, the Lonely is allowing 4s per ton and the Eileen Alannah will have to pay 3 per cent. of the gold extracted if the recovery is less than 85s per ton and 5 per cent. if above 85s. The Cam and Motor presumably, will have to pay a royalty on an equivalent basis.

THE LUCKY CROSS MINES—SWASTIKA

Written for the Canadian Mining Journal.

About 60 miles north of Cobalt, on the T. and N. O. Railway, is the station of Swastika, the centre of the Swastika mining district. Three of the claims of the Lucky Cross Company are traversed by the railway. A fourth claim is situated partly on the banks of the Blanche River. The claim numbers are T.C. 57, 58, 59, and 61. The station of Swastika is placed on claim 61. The general elevation of the country is 1,000 feet above sea level. An idea of the topographical features is conveyed by the accompanying photographs.

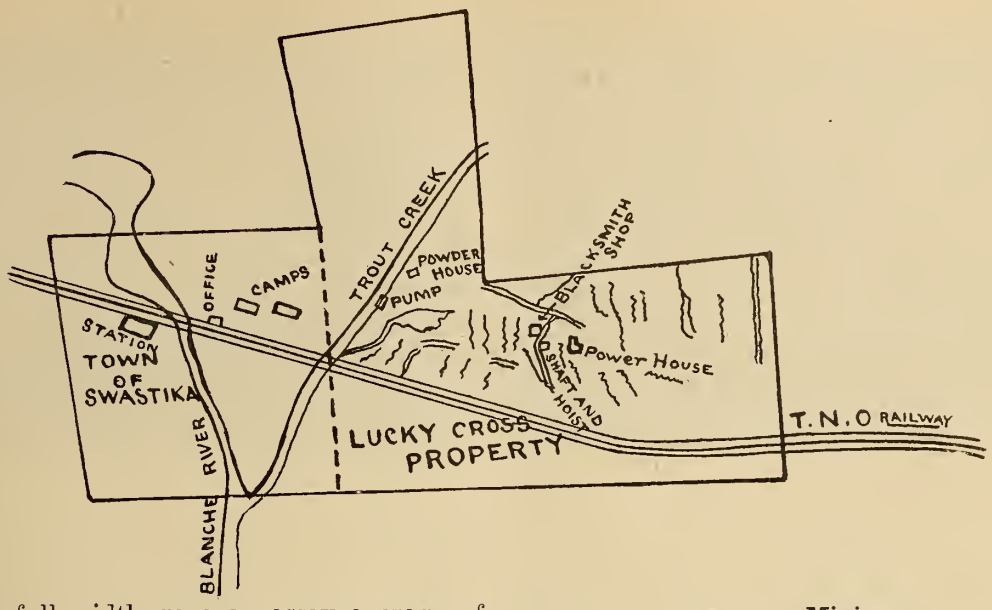
Veins.

Prospecting commenced in June, 1911. Two and one-half miles of trenching exposed no less than 41 distinct veins, 9 of which show visible gold. Several others give encouraging assays. Most of these veins occur in the middle claim. The results of work done are as follows:—

Vein No. 16, on which a shaft has lately been sunk to a depth of 111 feet, gave on the surface, for a length of 100 feet, $112 to the ton. The width on the surface averaged about 2 feet. At a depth of 55 feet the vein dipped out of the shaft. At this point it was four feet in width. It has been stripped for fully 300 feet.

Vein No. 4. The first discovery of gold was made on this vein at a point about 100 feet from the road. The vein here is four feet wide. A few samples taken here showed about $37 to the ton. Only 30 feet of the vein outcrops.

Vein No. 18. About 120 feet from the shaft the vein is 23 feet wide. A test pit sunk to a depth of



feet across the full width gave an assay average of $11.16 to the ton. The vein has been exposed for 100 feet. It is heavily overburdened. The lowest assay obtained was $8 to the ton.

Vein No. 21 has an average width of 3 feet, and shows visible gold. It is stripped for 30 feet. Assays ran $6 to the ton.

Vein No. 19 is about one foot wide. It is stripped for 150 feet and shows considerable amounts of visible gold. It has not been sampled.

Vein No. 7 is stripped for 100 feet. It is about 4½ feet wide. Assays average $4.50 to the ton.

Vein No. 29 is situated on the eastern claim. It is 30 feet wide. Assays taken over its entire width gave $4 to the ton. No gold is visible.

Equipment.

The equipment consists of one 100-h.p. boiler, return tubular, brick set; one 6-drill duplex Blaisdell air compressor; one 6x8 Jenckes hoist, and three No. 43 Rand drills.

Two large frame buildings accommodate 50 men. An office building, blacksmith's shop, stable, pump-house, magazine, and thawing house complete the list of buildings.

Mining.

Work on the shaft was commenced on November 17. On December 18 a depth of 111 feet had been reached. When this has been timbered a station will be cut. A cross-cut of a few feet will catch No. 16 vein. No. 4 vein, the original discovery, will also be cut underground.

A siding will be laid at once quite close to the shaft to facilitate the handling of coal and other supplies. The siding will be not more than a few hundred yards long.

Much of the quartz is slightly impregnated with copper sulphide and iron pyrites. In places there are occurrences of masses of iron pyrite. Associated with the copper sulphide fine powdery gold is often found.

The location is exceptionally favorable for economic mining. The railway was completed before the company commenced to work. Hence the buildings and working are situated most advantageously.

Two large streams, the Blanche River and Trout Creek, both of which flow into Lake Otto, flow through the property.

View near Swastika

Location Shaft No. 1, Vein No. 16.

No. 18 Vein—23 feet wide

Geology.

Extracts from Report of Mr. J. B. Tyrrell: The rocks of the Huronian formation underlie about two-thirds of the northwest portion of claim 61, and almost all of that portion of claim 59, which lies northwest of Trout Creek. The rocks consist of green conglomerates, graywackes, and slates, which are everywhere distinctly of a fragmental character. . . . They are now on these particular claims tilted to a high angle and have been much altered and metamorphosed until the finer varieties have been changed to a hard green slate or to a soft, silvery schist. The presence of pebbles or grains of jasper is a characteristic feature of these conglomerates and slates, and even in the finer grained schists the minute red particles of jasper can usually be detected with a lens, thus affording an easy and reliable method of distinguishing them from other similar rocks.

Camps and Office

The Keewatin and intrusive rocks include greenstone, diorite-prophyry, felsite, minette, diabase, granite, and vein quartz. . . . A line of profound fracture runs northeast through claims 61, 58, and 57. A number of quartz veins have been formed in this disturbed and fractured zone, and gold was distinctly seen to occur with the quartz in some of these veins. The fractured zone will almost certainly extend to a considerable depth and it is reasonable to expect that the gold-bearing quartz veins will extend downwards to very considerable depths in it.

Extract from later report made by Mr. J. B. Tyrrell as Company's Consulting Engineer: The veins, where the shaft left it, was still strong and well defined, and from the surface downward it had everywhere been liberally sprinkled with gold, as can be readily seen by an inspection of the dump of ore near the mouth of the shaft.

. . . . . .

Mr. J. W. Vandergrift is the company's local mine manager. His experience, gained in Nova Scotia and in the Western States, is proving of definite value to the company. His work at the Lucky Cross has been a record for rapid development. The claims were first staked in 1906, and were later owned by the Crawford Gold Mines Company. No discoveries were, however, made by Crawford, who did considerable work on two barren veins. They were acquired by Geo. M. Hurd & Co., of Philadelphia, in the spring of 1911. The Lucky Cross Company was then organized under the laws of Ontario, with a capitalization of $1,500,000, $500,000 in the treasury, $200,000 of which are being sold to develop the property. To date about $26,000 has been expended on the property.

TUBE MILL RATIO.

At the annual meeting of the Johannesburg Consolidated Investment Company Mr. Charles Marx stated that the new mill of the Consolidated Langlaagte would be 100 stamps and 10 tube mills, which is at the rate of one in ten, a considerably higher ratio than generally employed in Rand practice. However, the tendency is to increase the ratio of tubes to stamps, not on this field only, but throughout the world. The greatest ratio is on the Waihi Grand Junction mine, where 10 tube mills are employed with 40 stamps. With the assistance of its tube mills the 100 stamps at Langlaagte Consolidated should crush 45,000 tons monthly. The East Rand Proprietary only employs 25 tube mills to its 820 stamps; Bantjes 3 to 60 stamps; Brakpan 6 to 100 stamps; Cinderella 3 to 80 stamps; City Deep 5 to 110; Crown Mines 19 to 620; Durban Roodepoort Deep 3 to 100; Ferreira 3 to 100; Ferreira Deep 3 to 100; Geldenhais Deep 8 to 420; Jupiter 6 to 70; Knight Central 3 to 120; Knights Deep 6 to 270; Langlaagte Estate 5 to 200; Modders 5 to 180; Nourse Mines 7 to 260; Randfontein Central 22 to 775; Robinson 6 to 250; Robinson Deep 5 to 210; Rose Deep 7 to 300; Simmer and Jack 7 to 320; Simmer Deep, 9 to 105; Van Ryn 6 to 135; Village Deep 5 to 180; West Rand Consolidated 4 to 100; Wit Deep 4 to 245; and Wolhuter 4 to 120 stamps. The New Kleinfontein is the largest mine in the Rand which does not employ tube mills. It has 220 stamps. Other instances where no tube mill auxiliaries are employed are New Primrose,

Princess Estate, and City and Suburban. There are other mines, such as Glencairn, May Consolidated, Salisbury, and Jumpers, which are getting too near finality to run to the expense of tube mills. The Langlaagte Consolidated will have the largest ratio of tube mills to any mine on the Rand, followed closely by the Simmer Deep and Jupiter. At the El Oro mine in Mexico one tube mill is installed for each nine stamps.

THE MINERAL INDUSTRY IN THE PROVINCE OF QUEBEC DURING 1911

(Written for the Canadian Mining Journal by Theo C. Denis).*

During the year which has just closed the mineral industry in the Province of Quebec has been characterized by several features of importance. Foremost among these is the fact that the asbestos industry, which is the most important, laboured during the greater part of the year under abnormal and unfavourable conditions. During the preceding year, the production of all grades of asbestos had been pushed to its maximum, and as a result the asbestos market became congested; stocks increased to the extent that on January 1st, 1911, the stocks on hand had reached a value of nearly $2,000,000. As a result the prices dropped, to the extent that several mills are now shut down for an indefinite period. This applies specially to those asbestos properties which do not produce the long, crude fibre, and at present none of the Broughton mines are working.

There is no doubt that the high capitalization of some of the companies operating in the Thetford-Black Lake district has been one of the factors which caused this crisis. As mentioned in last year's review, the total capitalization of the asbestos companies sending in returns of production to the Mines Branch, and therefore on an operating and producing basis, was over $35,000,000, whereas the total value of the asbestos disposed of was $2,667,829.

Had the market for asbestos been unlimited; had the consumption been able to absorb all that could be produced the high capitalizations may have had some justification. But the above figure of production represents the maximum of absorption for the year 1910 at approximately remunerative operating prices, and although it is probable that the uses of asbestos will develop, it would be unwise to count on a yearly increase greater than 8 to 10 per cent. for some years to come. It is probable that financial reorganization of some asbestos companies will have to be effected in the near future, and it would be wise to keep these figures in mind. In all likelihood the shipments of asbestos for 1911 will fall below those of 1910.

To use a colloquialism, "the goods are in the mines" As we remarked last year, there is no sign of decrease in the contents of asbestos of the rock as depth is reached. That the faith of asbestos men in the value of the deposits is quite unimpaired was clearly demonstrated in the early part of 1911, when an asbestos property at Thetford, which had lain idle for some fifteen years owing to litigation, was put up at sheriff's sale, and, after lively bidding, knocked down for $710,000 to a syndicate made up of practical asbestos operators. A large mill is now in course of construction and will be in operation shortly.

*Superintendent of Mines, Mines Branch, Quebec.

Copper. Only two mines working on the cupriferous-sulphur ores of the Southeastern townships were on a shipping basis in 1911. These were the Eustis mine, at Eustis, a few miles south of Sherbrooke, and the McDonald mine, operated by the East Canada Smelting Company, situated at Weedon, some 35 miles north of Sherbrooke.

The figures of shipments will probably show a substantial increase, as the McDonald mine is now producing and shipping regularly at the rate of about 2,000 tons per month. This ore is mainly shipped to the sulphuric acid works of the Nichols Chemical Company at Capelton; the cinders are subsequently smelted for the recovery of the copper contents, the average of which is over 4 per cent. in the ore.

The deposit at the Weedon mine has been proved by drifts to be over 600 feet in length at the 100-foot level. It is lenticular in shape, and at its greatest width is 49 feet. A diamond drill hole, which was put down from the 100-foot level along the dip of the lens, went down 200 feet in ore, and is said to have stopped in ore.

Shipments from the Eustis mine were not as active as in 1910, and a certain quantity of ore went to the stock piles. Advantage was taken of this lull to push on the development work, and there is now ore in the mine blocked out for the next two years.

This progressive policy greatly adds to the value of the mine, which is now in very good shape. A great deal of the development work was done at the lowest levels, and the main slope, which is inclined at an angle of about 40 degrees, is about 3,000 feet long. The management is at present looking into the advisability of installing the Elmore oil concentration process.

A great deal of prospecting was carried on to the northeast of the MacDonald mine on the continuation of the same mineralized belt, which extends for several miles in that direction. Diamond drilling was resorted to, but so far the results have not come up to the expectations entertained.

Work of a prospecting nature was also done on the old Ives mine, at Eastman, by Mr. N. S. Parker. He has uncovered a very promising vein of chalcopyrite, and it is proposed to amalgamate several mines and prospects of that region to thoroughly test their possibilities.

Lead and Zinc.—A considerable amount of prospecting was done on a galena and zinc blende deposit, near Notre Dame des Anges, Portneuf County. The deposit consists of pockets of these sulphides in what appears to be a pyroxenite rock. The mass of rock is quite extensive and, besides the pockets, it contains impregnations and disseminations of crystals of galena, blende, pyrite, and copper sulphides. An average

often men have been working on this deposit for several months and a concentrator is spoken of.

Precious Metals.—After a long period of rest, the placer gold industry of the Province of Quebec has been very earnestly and, it is hoped, successfully revived. In the latter part of 1909, the Dominion Gold Fields Company (whose name was changed subsequently into the more characteristic title of Le Compagnie des Champs d'Or de Rigaud-Vaudreuil), acquired the mining rights for gold and silver of the Rigaud-Vaudreuil Seigniory, comprising 70,000 acres. After spending the greater part of the year 1910 in prospecting their large holdings, hydraulic mining was begun in the summer of 1911. Owing to a shortage of water and delays in the installation, the monitors were at work for a period of five weeks only. Dispositions were taken afterwards to greatly increase the storage of water to tide over periods of droughts.

As it was, the results were very satisfactory. The washed gravel gave an average yield of slightly under 50 cents per cubic yard, and with the improvements on the plant which are now being completed, next season should be a very profitable one.

Iron.—The Canada Furnace Company operated their charcoal furnace at Radnor Forges, where they use a mixture of bog iron ore produced locally and of Ontario magnetite. The supply of local bog iron ore is diminishing year by year, and by far the greater proportion of ore used at Radnor is now Ontario ore

Mica.—The mica industry which centres in the region north of Ottawa, was more active in 1911 than during the previous year, and the figures of shipments will show a substantial increase as compared with the previous year. The prices which ruled this year were more satisfactory, and the greater part of the stocks which had accumulated during the two preceding years were disposed of.

Peat.—An earnest resumption of work in the peat industry of the Province of Quebec took place during the year 1911. A company "Peat Industries Limited," with offices in the Imperial Bank Chambers, Montreal, installed an improved peat machine on the extensive Farnham bogs, and the results are said to be satisfactory.

Building Materials.—Limestone, granite, marble, and various kinds of trap rocks are actively worked in the Province of Quebec, and three large cement factories, with a combined annual capacity of two and a quarter million barrels of cement are steadily producing. In 1910, the quantity of cement manufactured was over one and one-half million barrels, and the figures for 1911 will probably show a substantial increase. The increased activity in the building materials industry is a natural sequence of the growth and development of the country.

Mining Law.—As to legislation, it may be mentioned that during the session of 1910-11, of the Quebec Legislature, a measure was passed and assented to on March 14th, 1911. This enacts that in the future the mining licenses shall be granted at a yearly rental of 50 cents an acre, instead of $1 as it was previously. Moreover, working conditions are now imposed. Therefore as it is now in force, the Quebec Mining Law provides for: Issuance of miners' certificates, which entitle the holder to stake out claims, to a maximum of 200 acres, on lands the mineral rights of which belong to the Crown. After staking and registering a claim, this can be held for six months without any disbursement. At the expiration of six months, a mining license is taken out at the rate of 50c. an acre per year. During the first six months after staking, work must be done on the claim to the amount of 25 days of the labour of one man. After the mining license is taken out, work to the extent of 25 days a year for each 40 acres is exacted. This mining license is renewable yearly, on proof that the working conditions have been fulfilled. If preferred, a patent can be obtained by buying the claim outright at the rate of $20 or $10 an acre, according to its distance from a railway, and in this case all the money paid as rental for mining licenses is deducted from the purchase price.

MINE RESCUE SERVICE OF THE STATE OF ILLINOIS

By H. H. STOEK, Urbana, Ill.

[Article reprinted from December Bulletin of the American Institute of Mining Engineers.]

The origin of the Mine-Rescue Service of the State of Illinois can be traced to two distinct sources, the work of the Rescue Station at Urbana and the Cherry disaster.

During the early part of the year 1909, the Technologic Branch of the U. S. Geological Survey, now the Bureau of Mines, in connection with the Illinois Geological Survey and the College of Engineering of the University of Illinois, established at the University of Illinois, in Urbana, a branch rescue-station to supplement the work of the Pittsburgh station of the Geological Survey. As a result of the work of training at the station in Urbana by R. Y. Williams, mining engineer, and James Webb, foreman of the Bureau of Mines, and the use of the helmets at several mine-accidents in the State of Illinois, the people of the State were somewhat familiar with oxygen-helmets when the Cherry disaster occurred, in November, 1910. The oxygen helmets were successfully used in connection with the disaster, and upon the recommendation of the Illinois Mining Investigation Commission, the Legislature of the State, assembled in special session during the winter of 1910, passed a bill appropriating $75,000 for the erection and maintenance of three rescue-stations stipulating that they should be located in the northern, central, and southern parts of the State. The Act also provided that the stations should be in charge of a Commission of seven, two representing the United Mine Workers of Illinois, two the mine-operators, one the Federal Bureau of Mines, one the State mine-inspector and one the Department of Mining Engineering of the University of Illinois.

This Commission was called together by the Governor of the State, Aug. 2, 1910, and since that time three stations have been located, built, and equipped: at La Salle for the northern part of the State, at Springfield for the central, and at Benton for the southern part of the State. Men are now being trained at these stations in the use of oxygen rescue-apparatus, and in rendering first aid to the injured.

Description of Buildings.—The station buildings were designed and built under the direction of the State Architect, after sketches furnished by the Commission. As the three stations were built from the same plans, a description of one building will suffice.

The foundations are of solid concrete. The walls of the building are of timber covered on the outside with metal lath coated with two coats of plaster throughout. The extreme dimensions are 61.5 by 87 ft. The height to the peak of the roof is 29.5 feet.

The front part of the building has two floors and contains the living apartments, office, and workshop. The rear portion contains the training chamber, which is one story in height.

The basement contains a store-room, coal-room, and furnace-room, and has a concrete floor and finished concrete walls throughout.

On the first floor, at the left of the entrance, is the office of the superintendent, in which there is a large closet for the storage of maps. Back of the office is a hallway leading to the dining-room, which also serves as a general living-room. Off of this hall is a closet and toilet. Back of the dining-room is the kitchen, off which is a commodious pantry and a rear entrance. From the front entrance a hallway leads to the training-chamber, and on the right of this hallway is a large room used for the storage of the helmet-equipment, oxygen-tanks, potash-cartridges, and other supplies. One end of the room is fitted up as a work-shop for the repairing of apparatus, and in this part are the appliances for the charging of the electric lamps used in connection with the helmets.

The second floor includes a dormitory, containing 12 white enameled iron beds. Adjoining the dormitory is a commodious toilet fitted with lockers, shower-baths, wash-bowls, and other toilet facilities. There is also a bath-room on the second floor. Three rooms are available as bedrooms for the family of the superintendent or for other purposes. A commodious linen-closet, an attic over the front part of the building and over the training-chamber and the cellar give ample storage space.

The building is well lighted with electricity and thoroughly ventilated by means of numerous well-placed windows. It is finished throughout in natural wood stained a dark color, and presents an excellent appearance.

The rescue training chamber and lecture hall occupy the rear of the first floor. The lecture or observation hall is a room 30 by 57 ft., lighted from above by skylights, but it can be darkened, when desired, by curtains over the skylights. The sides of the lecture hall are of glass, thus giving a full view of the training gallery which surrounds the lecture hall on three sides. The lecture hall seats about 100 persons, is well lighted, and is provided with a special lighting switch, so that a stereopticon can be used for lecture demonstration purposes.

The training gallery is an air-tight chamber in which sulphur can be burned, and in which training with the helmets and other rescue apparatus is carried on. The right side of the gallery is 8 ft. wide and 10 ft. 4 in. high, and in this part there are placed a mine track and a mine car. The left side of the gallery is 6 ft. wide, and is divided horizontally into two parts, the lower part being 5 ft. 2 in. high and the upper 4 ft. 7 in. high. This division allows work to be carried on in restricted quarters, and the upper part also serves as an over-cast. In the lower part a pile of rock has been placed to represent a fall, and at one end is a toilet. The mine track from the right side extends across the end, and there is also a tunnel through which men wearing the helmets crawl as part of the training.

Cost.—The entire cost of each building was approximately $10,000, exclusive of ground, which was donated in each city by the citizens. About each building is a commodious lot which contains a side-track for the rescue car, and also affords space for a garden for the superintendent of the station.

Rescue Cars.—At each of the stations there is a rescue car for use in transporting appliances to the scene of an accident. It is also fitted up so that a rescue party may have a comfortable place in which to stay at the scene of the accident. Two of these cars, completely equipped, were donated to the State, one by the Chicago, Milwaukee & St. Paul railroad, the other by the Chicago & Northwestern railway. The third car was purchased from the Pullman Co., and was refitted at the shops of the Toledo, Peoria & Western railroad in Peoria, Ill.

The cars are Pullmans, and as the arrangement of the three cars is practically the same, the accompanying description of Car No. 3 will serve also for the other two cars.

One end of the car is occupied by the heater, coal-box, and the locker for linen, and on the opposite side of the aisle is the toilet.

Three double-compartment berths on each side of the car will accommodate 12 persons, sleeping singly. The kitchen is fitted with stove, sink, and pantry, and an ice-box is beneath the car. The state-room, intended as an office for the manager or whoever is in charge of the rescue-work at the mine, contains a double berth, a desk, and a small toilet.

The end of the car used for storing the rescue apparatus may also be used for demonstration purposes, but the space is small, and it is preferable to demonstrate the use of the apparatus outside the car, or in a suitable room. In one corner are three oxygen tanks, connected to a pump. On the opposite side is a storage rack for seven additional oxygen tanks. In one corner is a coal box and in the other a locker for the pulmotor, first aid supplies, and other small articles, and for the storage of potash cartridges. The helmets are hung by hooks from the ceiling of the car, and, to prevent them from swinging, there is a strap that goes to the floor and is caught into a ring by a snap hook when not in use. The helmets are covered by a canvas cover to protect them from dirt.

Helmet Equipment—Each station now has ten helmets of the Draeger, Westphalia, and Fleuss types, and at least five more will be added in the near future. Whether or not any one form will be adopted as a standard cannot be stated at this time; probably not; but even if this should be done, examples of other types that are in common use will be maintained at each station for purposes of demonstration.

A systematic account is being kept of the cost of operation and maintenance of the different types of apparatus used at each of the stations, but sufficient time has not yet elapsed so that reliable cost figures are available. Since in training large numbers of men the

cost of maintaining and operating a helmet is a much more serious item than the original cost of the helmet outfit, the type of apparatus ultimately adopted for training will no doubt depend largely upon the cost of operation as determined by experiments now being made.

Each station has an adequate equipment of ordinary and electric safety lamps, two pulmotors for resuscitation, 20 oxygen tanks, each of 100 cubic feet capacity, and two oxygen pumps, one being kept at the station and one in the rescue car, so that there is always a spare pump.

Each station is equipped with a small library of mining books, the leading mining magazines, and with a stereopticon. By co-operation with the mining department of the University of Illinois, lantern slides have been furnished illustrating rescue and first aid work, the dangers of mining, and various other topics.

Each station has a complete equipment of supplies, charts, etc., as furnished by the First Aid Department of the National Red Cross Society, and in the training of men first aid is of equal importance with helmet work.

Station Staff.—According to the law establishing the Commission, the three stations are in direct charge of a manager appointed by the Mine Rescue Station Commission. Each station is in charge of a superintendent and an assistant. The salaries provided by law are as follows:

Manager, $3,000 per year.
Superintendent, $125 per month.
Assistant, $75 per month.

An amendment appropriating money for the maintenance of the stations during the two years ending June 30, 1913, gives the Commission authority to employ such additional occasional assistants as may be needed for the operation of the cars, and for the payment of lecturers on first aid and other technical subjects.

The superintendents and assistants were selected after a preliminary competitive test and examination held at Springfield. Those who passed the preliminary examination spent several months at the Urbana station receiving training in rescue work and taking lectures in general mining subjects, the lectures being furnished by the staff of the Department of Mining Engineering, the State Geological Survey, and the members of the Federal Bureau of Mines located in Urbana. The men finally selected as superintendents and assistants were also given a period of training at the Pittsburg station of the Federal Bureau of Mines.

Training.—Any men, who apply to the station individually or who are sent there by their employers, are given a course of training with oxygen helmets, in the use of oxygen reviving apparatus, such as the pulmotor, and in first aid. When they show that they are familiar with the operation of the apparatus and can perform within a period of two hours the following tasks, they are granted certificates as members of the Illinois Mine Rescue Corps. A distinctive button is also awarded.

The tasks included in the two-hour test are:

1. Eight complete trips around gallery on ground floor.
2. Ten trips over over-cast.
3. Each man carries 25 bricks over over-cast.
4. Crawl through tunnel three times.
5. Carry four props over over-cast.
6. Saw two props.
7. Set five props and knock them out.
8. Hang canvas, take down and fold up.
9. Pull weight 60 times.
10. Two men carry dummy once around gallery, lifting dummy over car.
11. Two men push car once around gallery.
12. Eight complete trips around gallery on ground floor.

The time of training varies from one to two weeks, depending upon whether the men devote all their time to the training and live in the station during the period of training, or come to the station from adjacent mines, and devote only such time as they have from their regular duties. No charge is made for the training, and, if they desire, 12 men at a time can be lodged in the dormitory free of charge. The superintendent has the privilege of running a boarding table for which those in training pay, or they can board outside the station if they prefer.

The mining law passed by the Legislature just recently adjourned provides that a map of each mine in the State shall be filed with the Manager of the Rescue Stations, and these will be kept at each station for the mines in the territory contiguous to the station, so that in case of an accident the rescue party going from the station can study the map while en route.

The same law provides that candidates for the positions of mine inspectors and mine managers must pass an examination in rescue and first aid methods.

Although the stations have been equipped and in operation only a few months, both the operators and the miners of the State have shown their willingness to co-operate in every possible way with the Rescue Commission, and the work promises to be a potent factor not only in case of accident, but as an educational feature in combating the daily dangers of mining.

THE CONIAGAS MINES, LIMITED, ANNUAL REPORT.

The President's Address.

To the Shareholders of the Coniagas Mines, Limited·

Gentlemen:—The past year has been a very prosperous one for your mine, which has paid, in four dividends and bonuses, a total of 36 per cent. on its capital, making 71 per cent. of the capital stock returned to shareholders to date in dividends and bonuses.

Our statements show value of Ore in Transit and at Smelter, on which payment is not due, of..$440.454.20
Cash on Hand and in Bank 479,547.94

Total $920,002.14

The mine and its equipment is in most excellent condition, working without any serious delays during the year except the holidays provided by law. The mill has crushed during the year 52,320 tons, or an average of 169 tons per day, and shipped 1,643,616 ozs. of silver, contained in 1,418.4 tons of concentrates. The extraction in the mill was nearly 87 per cent.

The total ounces of silver mined and shipped during the year were 3,789,274 ozs. at the remarkably low cost of 8.8c. per ounce, including mining, concentrating, freight to smelter, sampling, assaying, and treatment charges, and all head office expenses and royalties, as compared with a corresponding cost for the previous year of 13.285c.

The average price received per ounce of silver was 53.175c. as compared with 53.55c. for the previous year.

The smelter charge for treatment (smelting, refining

and marketing the silver), amounted to 3.49c. per ounce, including treatment and refining costs of 0.49c., also included in cost of mining above.

The underground workings now cover about 25 acres of the 40 owned by your company, and since the end of the fiscal year we have started sinking a winze in good ore below the third, or 225-ft. level. The engineer's reports, based on careful surveys and sampling, show ore in sight containing 12,516,000 ozs. of silver, enough to keep the mine working on past year's rate of production for over three years.

The report of the assistant to the president, to the directors, on the year's operation of the mine, and the financial reports of the secretary-treasurer, are included in the report of the directors to the shareholders, and form a part thereof. The report of the directors of the Coniagas Reduction Company, and of the president of the Redington Rock Drill Company, Limited, to the shareholders of the Coniagas Mines, Limited, are also included.

The Redington Rock Drill Company, controlled by your company, has confined its operations to the manufacture in your own machine shop of repair parts for drills for your Mine, and a few extra machine drills for renewals or sale when completed.

The 15 machines operated during the year double shift show a cost for repairs of $5.02 per drill per month, which is a very satisfactory showing for the quality of the drills, which is reflected in the cost of operation of the mine.

Owing to deficiency in the water supply for milling purposes your directors entered into negotiation with the directors of other mines obtaining their supply from the same source, to the end that the Mines Water Supply Co. is being formed for the purpose of augmenting the supply by pumping from Mud Lake. The work is about completed, and the proportion of cost for construction which your company will be asked to provide will be about $5,000. It is proposed to submit a by-law of the directors authorizing a stock subscription in the Water Company for the approval of the shareholders as soon as the amount required is definitely ascertained.

It is a pleasure to have this opportunity of acknowledging one of the most important factors in the successful working of your properties, which is the loyal, enthusiastic service of the staff and employees, the great majority of whom have been in your service for several years.

I take pleasure in moving the adoption of the report.

R. W. LEONARD,
President.

St. Catharines, Ont., Dec. 18th, 1911.

Report of the Directors.

Report of the Assistant to the President:

To the President and Directors of the Coniagas Mines, Limited.

Gentlemen:—Herewith report of the operations of the company at Cobalt for the year ending October 31st, 1911.

During the year the mine has operated continuously, excepting holidays with an average force of 158 men, distributed as follows:—

Mines' Office and Supervision	9
Camps	4
Mining	103
Drills	4
Mining Maintenance	11
Milling	16
Milling Maintenance	9
Loading Ore	1
Lands and Roads	1
	158

The wooden foundations under battery posts in old part of mill, "30 stamps," were replaced by concrete. This work was carried on from January 10th to May 11th, and caused a loss of 20,558 stamp hours, or a total of 28 days for 30 stamps.

The operation of the mill has been most satisfactory, and the tonnage treated since the above alterations were made, has averaged 186 tons per day of 24 hours.

A canvas table plant has been installed and operating since January 1st, which enables us to recover a low grade concentrate which was previously going to waste.

The total amount milled during the year was 52,320 tons, averaging 36.3 ozs. per ton. The average value of tailings from the mill was 4.75 ozs. per ton.

Development work during the year has been mostly confined to the district between No. 2 vein and north boundary; and by a cross-cut from No. 9 vein on the second level towards the south-west corner of the property.

Veins Nos. 12, 18, 24 and 25 were discovered in first area, all producing high grade ore, and in second area veins 15 and 16 were cross-cut on second level. No. 15 is producing high grade ore, but No. 16 as yet has not produced as well as in No. 6 shaft, sunk from surface.

Preparations have been made to sink winze from third level on No. 2 vein as developments on adjoining property have shown good values below this.

During the year new veins Nos. 17 to 27 inclusive, have been discovered underground, all shown on accompanying plans.

No surface prospecting has been done.

All work, both in stopes and drifts, for the past year is shown on accompanying plans and sections.

Development of new ore bodies during the year has about equalled the value of silver taken out of the mine. This is estimated at 3,720,000 ozs., as against an actual shipment of 3,789,274 ozs.

Ore reserves in sight, October 31st, 1911, are estimated as follows:—

No. 1 Ore, Vein matter	4,100 tons at	3,000 ozs.	=12,390,000 ozs.
Milling Rock	89,000 tons at	20 ozs.	= 1,780,000 ozs.
Broken Rock on Stulls in Mine	29,000 tons at	40 ozs.	= 1,160,000 ozs.
Mill Rock on Surface Dump	10,500 tons at	30 ozs.	= 315,000 ozs.
Total			15,645,000 ozs.

Allowing 20 per cent. for possible over-estimation would leave an ore reserve on the 31st of October, 1911, of 12,516,000 ounces, which figure I consider conservative to base estimates on for the ensuing year.

This gives an ore reserve of about the same as on the 31st of October, 1909, after shipping in two years 5,718,804.91 ounces of silver.

The estimates are based on careful surveys made by Little & Baker, mining engineers.

The following was the quarterly output of the mine for the fiscal year, in ounces of silver.

All ore shipped went to the Coniagas Reduction Company, Limited, at Thorold, with the exception of one car of low grade.

	Mine Ore.	Concentrates.	Total oz. Silver shipped.	Total oz. Silver paid for
1st Quarter....	639,782.71	584,546.21	1,224,328.92	1,156,579.02
2nd Quarter....	430,174.35	337,566.76	767,741.11	720,641.15
3rd Quarter....	475,055.01	308,053.61	783,108.62	736,606.40
4th Quarter....	597,949.64	416,145.62	1,014,095.26	956,996.99
	1,646,312.20	2,142,961.71	3,789,273.91	3,570,823.56

Totals of Shipments from the Mine.

Year 1st Nov. 31st Oct.	Mine ore Tons	Mine ore Ozs.	Concentrates Tons	Concentrates Ozs.	Total Tons.	Total Ozs.
1905-06	289	657,513			289	657,513
1906-07	2,655	1,341,372			2,655	1,341,372
1907-08		Mine Ore and Concentrates			627.5	1,457,210
1908-09	350	807,253	426	599,975	776	1,407,228
1909-10	330.1	979,630	645.5	949,901	975.6	1,929,531
1910-11	619.1	2,142,536	1,418.4	1,643,616	2,037.5	3,789,274
Total to Oct. 31, 1911	4,243.2	5,928,304	2,489.9	3,193,492	7,360.6	10,582,128

This includes 466.8 tons of Canvas Table Concentrates, and original slimes from mine, which averaged 115 ozs. per ton.

Coniagas Mines, Limited, incorporated November, 1906.

Concentration of Ore began September 24th, 1907.

Mine Ore and Concentrates shipped and treated together during 1907-08.

Work done to date and work done during the year ending October 31st, 1911:

	Total to Oct. 31, 1911	Total to Oct. 31, 1910	Work done during 1910-11
Shaft Sinking, feet.....	597	539	71
Drifting feet.....	10,006	6,649	3,335
Cross cutting, feet.....	2,843	2,032	811
Winzes, feet.....	252	232	20
Raises, feet.....	276	233	184

	Tons removed Since beginning of operations to Oct. 31, 1911.	Tons removed to Oct. 31, 1910.	Tons removed during 1910-11
Crosscutting and Waste	17,798	11,053	6,745 Barren Rock
Drifting	32,359	22,359	10,000 Pay Rock
Stoping	99,872	59,568	40,304 Pay Rock
Open Cutting	4,680	4,680	
Shaft Sinking	2,265	1,910	355 Pay Rock
Winzes and Raises	1,281	1,000	281 Pay Rock
	158,255	100,570	57,685

Ore Milled in Tons, to Oct. 31st, 1911.

Total to Oct. 31st, 1911.	Total to Oct. 31st, 1910.	Milled during 1910-11.
119,088	66,768	52,320

Surface Dumps.

Remaining Oct. 31st, 1911.	Remaining Oct. 31st, 1910.	Removed during 1910-11.
12,020	14,020	2,000

Note.—The 2,000 tons removed from surface dump were jig tailings, which were run through mill to make room for sand storage.

Milling Ore and Rock Hoisted, Tons.

	Total to Oct. 31, 1911.	Total to Oct. 31, 1910.	During 1910-11.
Milling Ore	119,088	66,768	52,320
Waste Rock	18,431	11,686	6,745

The Power Companies who supply compressed air were unable to keep up pressure during part of winter 1910-11. Our compressor was started and run during this period, which enabled the mine to run to its full capacity.

Thirty married employees are living on the property in houses owned by the company, and 50 per cent. of the balance in company's boarding house.

I cannot speak too highly of the services rendered by F. D. Reid, mill superintendent, who is responsible for bringing the mill to its present efficiency, nor of the services of Arthur Martin, mine captain, who has chrge of all work underground.

There have been no serious accidents during the year. Ten cases of typhoid developed during August, and resulted in one death.

Respectfully yours,
R. P. ROGERS,
Assistant to the President.

CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA, LIMITED.

Including estimated production for December, which was expected to be higher than that made in November, the total value of the production of metals at the smeltery of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, British Columbia, during the calendar year 1911, was approximately $4,750,000, in the following proportions:

Gold	$2,745,000
Silver	715,000
Lead	770,000
Copper	520,000
Total	$4,750,000

As compared with the production during the company's fiscal year ended June 30, 1911, this shows an increase in total value of about $312,000, or a little more than 7 per cent. This result is the more noteworthy since the tonnage received and smelted during the fiscal year was greater by approximately 60,000 tons, than that in the calendar year.

The decrease in tonnage was due chiefly to the cessation of operations at the Snowshoe mine, Boundary district, which mine had been for several years worked by the company, and from which a comparatively large quantity of ore had been extracted and shipped to Trail. During the fiscal year to June 30, 1910, the Snowshoe shipped 182,000 tons to Trail, but in the last fiscal year the output from the mine was only 86,000 tons, while the total for the calendar year now under notice was but 31,000 tons. Moreover, the several lead and silver-lead mines operated by the company,

with the exception of the Molly Gibson which increased its output, each shipped less to Trail in 1911 than in the fiscal year to June 30 of that year. On the other hand, the Le Roi, which the company acquired by purchase early last summer, shipped as much ore during the six months it was worked by the Consolidated Co. as it did during the whole of 1910, when its output was included in the custom ore receipts at Trail.

Reviewing the company's mining operations in 1911, the following notes will serve to show what the most important of these were:

Centre Star Group, Rossland.—Tonnage of ore produced, approximately 195,000 tons. Metal contents: gold, 86,512 oz., silver 57,670 oz., copper 2,182,676 lb. Development work done; Drifting 7,300 ft., crosscutting 2,812 ft., sinking 209 ft., raising 1,617 ft., total narrow work 11,938 ft.; diamond drilling, 19,861 ft.

Development has been along the usual lines of maintaining the ore reserves. A number of new ore bodies have been opened, particularly in the lower levels of the War Eagle mine. Development and stoping are so regulated as to maintain a practically constant average output of 16,000 tons of ore per month. It is probable the production of 1912 will equal, if it do not exceed, that of 1911.

Beyond the replacement of two low-pressure boilers by a 150 h.p. high-pressure h.r.t. boiler, there was little addition made to plant other than that connected with development work as this was done. Neither was there any change of importance in connection with surface works generally, buildings, etc.

Le Roi.—During the five months of the year this mine was operated under the direction of the liquidator of the Le Roi Mining Company, Limited, its production was 5,502 tons, containing 2,853 oz. gold, 4,183 oz. silver, and 141,667 lb. copper. Since then, after it passed into the possession of the Consolidated Company, production was as follows: Ore produced, about 12,900 tons; containing 4,017 oz. gold, 5,542 oz. silver, and 263,369 lb. copper. Preparations are being made to considerably enlarge the output in 1912.

Development work has consisted largely in making connections with the Centre Star mine at various levels. The motor haulage system has been extended from the Centre Star into the Le Roi on the levels that have been connected, so as to allow of ore from the Le Roi being hoisted through the Centre Star shaft and passed over the sorting tables of the latter mine. The big boiler plant of the Le Roi has not been used latterly, but instead air from the Centre Star compressor has served to operate the hoist in the Le Roi main shaft.

St. Eugene. — Production of ore was only about 34,600 tons, as against 47,700 tons in the last fiscal year; concentrate produced was 5,136 and 7,708 tons, respectively, for the two periods. The falling off for the calendar year was therefore considerable. The metal contents of the concentrate shipped to Trail in 1911 were: Lead, 5,882,000 lb.; silver, 136,150 oz. For the first time in its history while being worked the St. Eugene had to take second place as a producer of lead in Canada. Its tonnage output was larger than that of the Sullivan by about 11,000 tons, but the lead content of the ore was much smaller. Leaving the Sullivan out of consideration, the St. Eugene continues to produce more than the combined output of all other mines in the Province. More than 2,000 ft. of development work and 1,000 ft. of diamond-drilling was done. The ore testing plant at the St. Eugene was operated intermittantly as required, and results were of much interest.

Sullivan.—This mine, also in Port Steele mining division of the East Kootenay, produced rather more than 25,000 tons of ore during the year, which output was nearly 9,000 tons less than during the last fiscal year. Metal contents of the 1911 output were nearly 11,000,000 lb. of lead and 187,500 oz. of silver. About 1,900 ft. of narrow work was done in further development of the mine, and approximately 7,500 ft. of diamond-drilling. This work showed the existence of large reserves of ore.

A new power system and an ore-sorting addition are being put in. The former includes a concrete dam 20 ft. high and 50 ft. wide, on Mark Creek, and a 30-in. continuous wooden stave pipe line, 4,380 ft. in length, to a compressor building 80 by 40 ft. Of three 6-ft. Pelton wheels, two are connected by a rope-drive to a compressor having a capacity of 3,000 ft. of free air per min., and one to a 120 kw. 2200-volt generator. Compressed air will be conveyed to the mine through an 8-in. pipe-line about 5,100 ft. long.

The sorting house contains a 15 by 24-in. Farrel crusher, bins, trommels, and a 36-in. sorting belt 60 ft. long. The ore-sorting house is so arranged that ore can be picked out of the waste where the latter predominates, or vice versa. It is the intention to also make a second-class product to consist of ore high in zinc and low in lead. The terminal of the tramway has been removed to the storage bin below the sorting house. A tunnel has been opened from the 100-ft. level of the mine out to the sorting house; electric motors will be used for haulage on this level.

Other additions are to be made to surface plant, buildings, etc. and generally the policy being followed here is with the object of permitting for a gradually increasing production of ore, of which there is known to be in the mine a very large tonnage.

Richmond-Eureka.—The quantity of ore produced at this Slocan property was less in 1911 than 1910, only about 2,300 tons as compared with 4,000 tons. Not many men were worked throughout the year, and those chiefly in further development, the expense of which was covered by the proceeds of ore extracted. Metal contents of ore shipped were 428,000 lb. of lead and 78,400 oz. of silver.

Molly Gibson.—This mine is in Nelson mining division, about 20 miles northeast of Nelson City. During 1911 an aerial tramway, from the mine towards the west arm of Kootenay Lake, was completed; its total length is 4½ miles and it has reduced the distance over which ore must be hauled in wagons from 10 to less than 5 miles. A cross-cut tunnel is being driven 200 feet below No. 6 level of the mine; the face of this is now about 500 ft. from the portal, and the vein is 300 ft. ahead. A raise will be made in the vein to No. 6 level. The new level will be the main ore-outlet from the mine, and in preparation for this a site for the upper terminal of the aerial tramway is being excavated in solid rock in the side of the mountain so as to be out of the way of snowslides, which have been a yearly surface danger at this mine.

Development work has resulted favourably, so that the prospects for this property are now better than at any previous time since it was acquired by the Consolidated Co.

The concentrating mill has been put in working order; among the changes made in its equipment was the substitution of a Huntington mill for the 5-stamp

battery previously in use. Minor alterations and repairs were numerous, and the plant has been thoroughly overhauled. More water power has been developed on Kokanee Creek; a second flume 3,000 feet long has been constructed and 900 feet of 20-in. pipe put in, giving a head of 150 ft. The power derived operates a compressor having a capacity of 500 ft. of free air per min., and this has been connected to the old air lines by 3,200 ft. of 4-in. pipe. A dynamo, for electric power and lighting purposes, has been installed.

Construction work will be completed and development of the mine so advanced that ore production in 1912 may be expected to be on a considerably increased scale as compared with present capacity of mine.

No. 7 Mine. — No ore production has been made from this mine since last March, but prior to the close of that month 775 tons was received at Trail from it. Much development work was done, and the ore-sorting plant was completed and ore bins built at the lower terminal of the aerial tramway.

Other Properties.—Little or nothing was done at the company's Phoenix Amalgamated property, in Boundary district. The company took under bond the Hudson Bay group and the Silver Dollar, both in the vicinity of Salmo, Nelson River mining division, and the No. 1 and Tiger, both in Ainsworth camp. Work is being done on all these properties with the object of proving their value. The indications are that a large body of lead ore may be developed at Salmo. The ore of the other mines mentioned contains silver and lead.

Smeltery and Refinery.—Other than the installation of two units of the Dwight-Lloyd sintering process plant, for roasting ores, there were not any important additions to the plant at the Trail works. Many changes were made, though, to facilitate the handling and sampling of ores; included in these is a rearrangement of the Huntington-Heberlein roasting plant, which when completed, will be so placed as to make for greater convenience and effectiveness in the future.

Both copper and lead sides of the big reduction works at Trail have been, and are being maintained in a condition and on a scale demonstrating progressiveness and general adaptability to the varied ore reduction needs of the Kootenay and other districts whence the ore supply is drawn. The official staff at mines and reduction works was little altered during the year, the most important change having been the resignation of Mr. A. J. McNab from the position of superintendent of the smeltery, and the promotion of Mr. James Buchanan to fill the vacancy thus occasioned. Mr. M. H. Sullivan succeeded Mr. Buchanan as metallurgist, and Mr. B. A. Stimmel moved up to take Mr. Sullivan's place as chief chemist. Mr. R. H. Stewart remains general manager, Mr. S. G. Blaylock, assistant general manager, and Mr. T. A. Bingay, comptroller.

PERSONAL AND GENERAL

Through inadvertence the address of Mr. A. D. Miles, who has taken offices in Toronto as representative of the International Nickel and the Canadian Copper Company, was given as the Standard Bank Building in our last issue. This is incorrect. Mr. Miles' address is Room 801, Traders Bank Building.

Mr. Harry Hanson, of the Dome Mine, Porcupine, is spending his Christmas holidays in California.

Mr. R. Anson-Cartwright is in Toronto, at 34 Dundonald Street.

Dr. W. L. Goodwin, director of the School of Mines, Kingston, Ont., visited Toronto on December 21st and 22nd on business connected with the Department of Education.

Mr. John L. Retallack, manager of the Whitewater group of mines and the Washington, both in Slocan district, has returned to Kaslo from a visit to the Coast district of British Columbia.

Mr. Charles Dempster, manager of the Fife mine, situated in the eastern part of Boundary district, B.C., is again in Rossland, after an absence of about three months in New York and other eastern cities.

Mr. Charles F. Caldwell, manager of the Utica mine, in Ainsworth division, British Columbia, has been in Victoria, urging upon the Government the necessity for a wagon road being constructed to facilitate getting ore from his mine to the Kaslo and Slocan Railway.

Mr. T. D. Pickard, of Vancouver, B.C., was in Hedley camp, Similkameen, last month, in connection with the prospecting work being done on the Apex property, situated in the vicinity of the Nickel Plate group, and on which he and associates have a working bond.

Mr. Thomas Graham, for several years general superintendent for the Western Fuel Company, owning and operating the No. 1 Shaft, Protection Island, and Brechin coal mines, near Nanaimo, Vancouver Island, B.C., has been appointed chief inspector of mines for British Columbia, in succession to Mr. F. H. Shepherd, who resigned to become the representative of Nanaimo district in the Dominion House of Commons.

Mr. Thomas Kiddie has returned to British Columbia from Morenci, Arizona, where he was visiting his elder son, John, who is in charge of the Arizona Copper Company's engineering department, and is also geologist for that company. Mr. Kiddie, Sr., hastened his return to British Columbia in order to investigate for principals a new zinc reduction process now attracting attention in that province.

The three directors of the Tyee Copper Company, who were in British Columbia last month, have left on their return to England. Mr. W. J. Watson, for several years the company's smeltery manager at Ladysmith, Vancouver Island, and who was appointed acting manager on the retirement recently of Mr. W. H. Trewartha-James, remains in charge of the company's affairs in British Columbia. It is understood that the company purposes extending its operations and enlarging its smelting works.

Mr. W. E. Zwicky, manager of the Rambler-Cariboo mine, Slocan, B.C., and who is directing the development work recently undertaken on the Payne mine, in the same district, has been reported by the Spokesman-Review, of Spokane, Washington, as having said in that city, when there recently: "American lead

miners need not be worried about competition from Canada, because we now have a Government which believes in the protection and development of home industries, and we propose to close our markets to lead and lead products from the United States, Mexico, and all other countries in the world.''

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt, Gowganda and South Lorrain.

The announcement of railroad facilities for Elk Lake and Gowganda has already caused a considerable awakening of interest in that somewhat neglected field. At Elk Lake there was a rush of prospectors to restake, and the Hitchcock and the Beacon Consolidated companies have announced their intention to commence operations again. At Gowganda the Millerett and the Miller Lake O'Brien have been steadily producing all the year, and development work has been so successful that ore reserves have been little, if at all, depleted. The diabase section of the Millerett at the 150 and the 200-foot levels is showing up remarkably well, and is yielding the bulk of the mill ore to the concentrator, which is treating 35 tons per day, while a considerable amount of high grade is handpicked from both the conglomerate and the diabase. On the other side of the lake the Miller Lake O'Brien has now extensive stopes of high grade ore on the 150 and the 250-foot levels, and so far the veins have shown no indication of petering out either in width or values. Shipments have been steady. At Gowganda itself the Mann property has commenced work again and is mining ore, the Powerful Mining Company at Calcite Lake, has cut its vein and is sacking ore, and so is the Canadian Gowganda, midway between Gowganda and Calcite Lake. With the railroad facilities, many prospects will certainly be opened directly supplies can be taken in and ore taken out at less ruinous rates than at present. The wagon road built into Gowganda by the Government is so bad that with some snow on the ground it takes fifteen hours for a passenger rig to travel.

The Beaver Consolidated position for the quarter ending November 30th was as follows: Cash on hand, $107,286. In addition, payments to be received from the smelters amount to $51,000. The fifty ton mill is making good progress and should be ready the second or third month of the new year.

The November production of the McKinley-Darragh Savage mine totalled 220,000 ounces, of which 85,000 ounces came from the Savage property. This brings the total production for the year to 2,434,000 ounces, or only 200,000 ounces short of last year's total, with a month to run. The mill has been running an average tonnage of 40-ounce ore per day, and practically all the shipments from this property have been concentrates.

Despite predictions to the contrary, the La Rose Consolidated paid its regular quarterly dividend of two per cent., requiring a disbursement of $150,000. The company has now paid back 37 per cent., or $2,579,185. The Nipissing, too, will pay their old rate of seven and a half per cent. on January 20, bringing total disbursements to 129 per cent., or $7,740,000. The regular quarterly dividend calls for $450,000, and an average of about $226,000 net is being produced each month. The surplus of the Nipissing on Dec. 9th was $1,421,480, while the La Rose on or about the same date had a surplus of $1,516,042.

The first aerial tramway of any considerable length is now in operation between the Crown Reserve, the Kerr Lake mine, and the Nova Scotia mill, a distance of nearly a mile. The contract with the Crown Reserve calls for 85 tons per day, and the Kerr Lake 75 tons, while it is very probable that the Drummond will be sending 35 tons per day as soon as the tramway can be extended to them.

Porcupine, Swastika, and Other Gold Sections.

The event of the month in the Porcupine camp was undoubtedly the visit of the Canadian Mining Institute to inaugurate officially the gold camps branch. Though called at somewhat short notice, there was an excellent assemblage, and an exceedingly interesting meeting ensued. One hundred and six members attended the first meeting of the branch in the King George Hotel, and the papers read and the discussion were most interesting. Dr. Adams briefly defined the objects of the Institute and pointed out its growing importance in the world of mining. Dr. A. E. Barlow dealt with a letter that had been received from the Toronto Branch, stating the resolution arrived at in connection with the amendment of the Employers' Liability Act. Outlined it proposed the adoption of the English Act, which threw the burden of the proof of carelessness in the case of accident on the employer, this being the only impediment to the miner's obtaining compensation; it provided that the compensation should be provided from a fund jointly contributed by the employer and the employee, and it fixed the amount for fatal accident at $1,500, or three years' wages. Mr. W. F. Ferrier explained the position taken by the Toronto Branch. Mr. G. C. Bateman, who occupied the chair, read a very interesting paper on the sampling of Porcupine veins, and a brisk discussion followed. Mr. Hy. Hanson, who is in charge of the construction work of the Dome mill, read an interesting paper on fine grinding, in which he emphasized the increasing importance of tube mills, not to replace, but in conjunction with, stamps.

Mr. A. E. Burrows opened a discussion on various geological characteristics of the Porcupine camp. He had found scheelite rock on the Jupiter, and hessite on the Powell, in Deloro. He thought that if telluride were to be found in paying quantities it would have been discovered before now, but scheelite containing tungsten might easily have been mistaken for other minerals, and it might be of economic importance to the camp. Mr. Carl Reinhardt, of Cobalt, expounded a theory of the classification of the Northern Ontario rocks, and the origin of the Cobalt ores.

On Sunday the visitors separated into three parties, and visited the Dome, Hollinger, McIntyre, Vipond, and Rea in succession.

A local committee of the Porcupine branch was formed of C. H. Pourrier, manager of the Vipond; C. E. Watsou, manager of the Plenaurum; A. H. Smith, of the consulting firm of Carter and Smith; A. P. Globe, superiutendent of the Hollinger; R. Rattray, manager of the Jupiter, aud H. C. Meek, superintendent of the Dome.

Just previous to the visit of the Mining Institute, three important discoveries had been made at the properties on or near Pearl Lake. Drifting towards Pearl Lake on the 200-foot level from the No. 4 shaft the McIntyre struck into a good body of ore sixty feet from the shaft. While assays were lean in the first shots, they gradually increased until an average of about $14 was obtained over four feet after careful sampling, and the hanging wall of the vein had not been reached at the date of writing. From the same No. 4 shaft, too, No. 4 vein has been cut. At the point of intersection the company show 26 feet of vein matter, going $19.50 to the ton. Forty feet of this vein has been drifted upon, and good average values have been obtained. On the other side of the lake the

Jupiter opened up another nice bunch of ore in a crosscut to connect two workings. The vein is about four feet wide, and the average values are high for properties of this section of the camp.

At the Plenaurum, at the east end of the lake, an unexpected body of quartz, showing visible gold, was struck in the shaft at 120 feet. As neither of the veins between which the shaft was sunk show any tendency to dip towards the shaft, this is presumed to be another vein.

On the Hollinger the rumour of a strike on the 200-foot level synchronized with a sudden rise in the stock. Though it was not generally known, the main vein, after it had been drifted upon for about 300 feet, was lost, and a considerable amount of crosscutting had to be undertaken before it was picked up the other day. Though there is no official information available it is stated that this continuation of the main ore body is four feet wide and shows very rich ore at the point of intersection.

Satisfactory progress is now being made with the Hollinger Extension of the T. & N. O. While it was in the contractors' hands the work seemed to lag badly, but since the railroad itself took it over there has been a great improvement. The steel is now laid right into the Aura Lake settlement, and a yard is laid out, so that machinery can be unloaded here. The trestle bridge over Pearl Lake will cause a little more delay, but the big rock cut beyond is finished and it should be possible to run freight into Timmins townsite by the middle of January or the first of February, or five months after the scheduled time when the work was first undertaken.

Two shafts are being sunk on veins on the Porcupine Reserve property. One of these is down fifty feet, and the shaft is almost entirely in quartz, the other is down 30 feet, and both will be taken to the hundred foot level before exploration work is commenced.

The Rea is now installing a larger hoisting plant, as it has been determined to sink to the 400-foot level without delay. Drifting is also in progress at the 300-foot level.

It is now admitted that delay in the steel work of the Dome mill will prevent the stamps dropping before the first of March. It will even then, in all probability, be the first mill to crush ore on any scale in camp.

W. R. Bauder, who has been manager of the McIntyre for a month or six weeks, has resigned, and Mr. William Cooper, formerly with the Bewick-Moreing Co., has been appointed to the position in his place.

At a depth of 1,140 feet in No. 3 drill hole on Pearl Lake mine, visible gold is seen in the core. Values run all the way from a trace to $20. The drill hole has been put down 1,250 feet and, according to the dip of the drill and the distance in which the cores were in values, it is computed that the ore body penetrated was about fifty feet thick.

The Gold Pyramid Company, of Munro Township, has ordered ten more stamps for its battery, which at present consists of five stamps. At present two other mines in the vicinity of the Gold Pyramid have small stamp mills running.

It is reported that the Murphy Mitchell claim in Carscallen township, has been optioned by a French syndicate for $200,000. The option takers will go to work at once, and probably instal a small plant.

BRITISH COLUMBIA.

Comprehensive information relative to mining in the province is contained in 33 pages of the "Year Book of British Columbia," by Mr. R. E. Gosnell, the "Coronation Edition," of which has been issued, having been published by authority of the Legislative Assembly of British Columbia. The chapter on Mines and Minerals deals first briefly with the great latent possibilities of the mining industry in western Canada, and then directs attention to the Cordilleran region, recognized as one of the greatest mining regions in the world, of which the part in Canada has a length of 1,300 and a width of 400 miles. The total area of the Canadian portion of this great region is placed at, approximately, 600,000 square miles. The following excerpt should prove suggestive to those interested in the mining industry of British Columbia: "A faint idea of the possibilities of this great region may be obtained from consideration of the fact that 'Pennsylvania, which is probably the best developed Appalachian state, now has an annual production of domestic minerals approximately equal to $9,340 per square mile of territory, or to $67 per capita.' Another illustration is that of Nova Scotia, which has an annual production of about $1,000 per square mile, or $4 per capita. At even $1,000 per square mile of mineralized territory, British Columbia's annual mineral production would, under like conditions of utilization of its minerals, amount to an immense sum, so that there is in the development of its mineral resources a great future awaiting the enterprise and energy of this Province and its people. Except in the far north, the 'Cordilleran region is largely a forested country. In the southern interior, however, are wide stretches of open grass-covered hills and valleys, noted for their fertility. Various districts have long been known to be rich in mineral wealth, and new ones are, from time to time, engaging attention. The mines of the region, which is pre-eminently a mining district, already yield virtually all the lead mined in Canada, more than half the gold, nearly three-quarters of the copper, fully one-quarter of the coal, about one-tenth of the silver, and a share of some other minerals. This high rank has been reached notwithstanding that prospecting of even the most desultory character has been carried out only over a very small, almost insignificant, part of the area, and this chiefly in districts lying south of the main line of the Canadian Pacific Railway. This comparatively limited amount of prospecting, though, has, in the districts covered, marked out various regions as being characterized by the occurrence of certain classes of mineral deposits. The Rocky Mountains, and the flanking foothills on the east, contain vast quantities of coal, but apparently are not otherwise rich in mineral wealth. Coal also occurs over other districts—in central-southern British Columbia, on Vancouver Island, on Graham Island of the Queen Charlotte group, in the Skeena River country, and elsewhere. Rich silver-lead deposits are characteristic of the country south of the Canadian Pacific main line railway, between the Rocky Mountains and the Arrow Lakes of the Columbia River; zinc in workable quantity also occurs in this part of the province. To the west and south of this, almost to the Fraser Valley—in Rossland and the Boundary camps, and in the Similkameen and Nicola country—are many deposits of ores containing copper and gold. Along the Pacific coast, on both the mainland and the islands, are numerous copper-gold deposits, with others in the Skeena country and also farther north. The chief placer-gold fields of the province are in Cariboo and Atlin districts, respectively. Iron ore is found in several places in the interior of the province, and on Texada, Vancouver, and other islands. Miscellaneous minerals include platinum, chiefly in the Tulameen district; cinnabar (mercury), in Kamloops district and on the west coast of Vancouver Island; pyrites, in the lower Skeena country; scheelite, in Cariboo; tungsten, at Sheep Creek, Nelson mining division; molybdenum, in Nicola district and various other parts; mica at Tete Jaune Cache, upper Fraser River; hydro-magnesite, at Atlin; gypsum in Ashcroft and Nicola mining divisions; and clays, building, and other stones, cement materials, sand, etc., all of more or less commercial value, and available for utilization and to contribute to the total of value of the mineral products of British Columbia."

To comment in detail on the whole of the information given on the mines and minerals of the province would require far more space than is here available, so a short summary of the

greater part of the particulars given in the Year Book must suffice for the present. The history of mining gives interesting information. Accompanying the review of mineral production are statistical tables showing comparative views of production over various periods; the lode mines come next, followed by an outline of the great potentialities of the province in placer-gold and coal. Mining and metallurgical facilities are stated, and then, under the heading of "What May be Expected," an interesting forecast is given. One of the most valuable features of the mining section is the review of the question of whether the economic conditions on the British Columbia coast are favourable to the development of an iron and steel industry. The chapter is concluded by a notice of the mining laws of the province.

In conclusion, the comments under the heading, "A Striking Comparison," are here quoted: "It is of interest to note that British Columbia continues to maintain its average proportion of the mineral production of the whole of Canada. Placing the aggregate value of the production of the Dominion for the 25 years, 1886-1910, included in the official records, at $1,130,000, it would appear that this province may fairly claim to have produced between 27 and 28 per cent. of this large sum. The aggregate value of the mineral production of the province for all years to 1910, inclusive, is $374,000,000. Deducting the total value of the minerals—chiefly for coal and placer-gold —produced prior to 1886, which was nearly $64,000,000, British Columbia's approximate aggregate for the 25 years is left at $310,000,000, which is between 27 and 28 per cent. of that of the whole of Canada. It is a striking fact, as indicating the substantial increase in the value of the mineral production of the province in recent years as compared with that prior to 1906, that fully 40 per cent. of this large value is the production of the last five years, 1906-1910, while more than half—nearly 54 per cent.—is that of seven years, 1904-1910."

Fuel Prices in Coast Cities.

Three ladies, who were appointed by the mayor of the city of Victoria to investigate and prepare a report on the high cost of living, have prepared a report which has been submitted to the city council. The committee which undertook the inquiry states that it has endeavoured to secure a careful and accurate comparison between the cost of living in Victoria and in neighbouring cities. The inquiry, therefore, by way of comparison, was limited to four cities, namely: Victoria, Vancouver, Nanaimo, Seattle (Washington). Included in the report, which is lengthy, is the following regarding the prices of fuel:

"In fuel, one of the most costly necessaries, there is but slight variation in the prices in the three cities mentioned below. Wood is selling in Victoria at an advance of 50 cents per cord above that in the other places. Coal sells at the same price in Vancouver as in Victoria—$7.50 per ton. The same coal retails in Seattle at $6.50 per ton, the Vancouver Island coal, because of its superior quality, being considered as cheap at that price as the local product at $6.50 per ton. Vancouver Island coal unscreened is delivered to the miner at $2.50 per ton, the estimated loss by screening being 35 per cent. Screened coal is sold to the public at the pit's mouth at $4.50 per ton; delivered at $5.50.

"A practical expert miner quotes the cost of production of coal in the Vancouver Island collieries at the outside $5.40 per ton f.o.b. It would seem that the coal merchants of Victoria are not responsible for the high prices paid by the consumer, as the mine companies evidently establish a price in common. It would appear in regard to this commodity, a case of utilizing one of the natural resources of the province for the making of wealth for the individual at the expense of the public, through selling at excessive profits one of the necessary articles of living."

It may be added that the question of the price of coal has been brought up in the Legislative Assembly of British Columbia in two successive sessions, but the situation is one that appears to be outside the sphere of the provincial legislators to take action upon.

GENERAL MINING NEWS.

NOVA SCOTIA.

Halifax, Dec. 14.—The North Atlantic collieries, Cape Breton, were to-day sold at foreclosure, and were purchased by Stone and Webster, Boston, for $70,500.

Halifax.—The Dominion Coal Company's new charter boat Lingan, which was launched at Middlesborough, England, on October 10, last, is due at Sydney. The Lingan was built by Sir Raylton Dixon & Co., Ltd., for the Furness, Withy & Co., of West Hartlepool, and is said to be of the latest improved type of patent cantilever construction, with topside water ballast tanks, and is being constructed to receive the highest class with British Corporation, single-deck type with poop, bridge, and forecastle. She is 388 feet 3 inches by 52 feet by 29 feet 9 inches moulded, and will have a d.w. carrying capacity of 7,600 tons. She has 11 hatchways and 4 holds free from all obstructions, such as beams, or web frames, and perfectly self-trimming owing to the sloping sides of the top-side tanks at each side of the ship. Of the total amount of about 2,400 tons of water ballast which she can carry, about half will be in the topside tanks. She has 12 derrick posts and 20 derricks, 4 boats, hand and steam steering gear. She is fitted with triple extension engines having cylinders 26, 44, and 73 by 48 inch stroke, supplied with steam by three boilers, working 180 lbs. pressure.

The Lingan is commanded by Capt. Paterson, formerly of the S.S. Rosanno, and left for Sydney early in December.

Halifax.—A syndicate of British capitalists, headed by Sir Thomas Lipton, has acquired extensive mineral leases in the southeastern portion of Conception Bay, Nfld., and propose tunnelling from the main land to strike the iron ore deposits which outcrop on Bell Island.

The point where the British holdings have been taken up is about eight miles from the Wabana mines, but any slopes driven from the main land to strike the Wabana beds have to be much longer than those which "Scotia" drove out to its 26 miles of submarine areas there.

QUEBEC.

Montreal.—A circular is being sent out to the Amalgamated Asbestos bondholders officially notifying them of the fact that the bondholders have obtained the consent of Sir Hugh Graham, Mr. W. G. Ross, and Mr. Henry J. Fuller, to act as a protective committee to protect the interests of the Canadian bondholders, and more especially to obtain representation of the depositing bondholders on any reorganization of the central advisory committee that may be appointed.

Similar protective committees have already been formed in England and the United States, and these will co-operate with the Canadian Committee.

The circular is signed by the following large bondholders: Hon. Robert Mackay, William MacMaster, Rodolphe Forget, M.P.; Burnett & Co., C. Meredith & Co., Thornton Davidson & Co., McDougall & Cowans, F. Orr-Lewis, Estate John MacIntosh, Preble MacIntosh, George Hyde, and William Frew Robertson.

No scheme of reorganization of the company can be voted upon by the Canadian Protective Committee until it has been submitted to and approved of in writing by the depositors of a clear majority in value of all bonds deposited with the

Committee, and as soon as a scheme of reorganization has been agreed upon by the Central Advisory Committee, such scheme will be submitted to the bondholders for approval.

Bondholders are requested to deposit their bonds with the National Trust Co., Montreal and Toronto, and in exchange they will receive a receipt.

Montreal.—Mr. A. J. Brown, K.C., has been elected to the Canadian Amalgamated Asbestos Bondholders' Committee, which is now composed of four members.

The Committee is anxious to have all the Canadian holders deposit their bonds with the National Trust Company, as the Canadian interests should be represented as largely as possible in the reorganization discussed.

ONTARIO.

Cobalt, Dec. 18.—Drifts to the east and west are being pushed on the big No. 4 vein from the 154-foot level of the Cobalt Lake mine, in an endeavour to pick up another ore shoot of a similar nature to the one which Manager Gordon found shortly after he took charge of the property this year.

BRITISH COLUMBIA.

Vancouver.—Thomas Kiddie, the well known metallurgist, former superintendent of the Le Roi smelter of Northport and the Ladysmith smelter, has returned from Arizona.

He will leave for Nelson to conduct on behalf of private parties a series of experimental tests of a new process for treating zinc ores. The process is known as the French system, after the name of the discoverer, A. G. French.

Important developments may result in the event of the tests proving successful.

Nelson.—Delegates from all over district No. 6 of the Western Federation of Miners met at Ymir, B.C., on December 19 to arrange matters of special interest to the miners' membership. They took action relative to the affiliation with the British Columbia Provincial Federation of Labour, deciding whether the locals of the district board will send the delegates; while the court decision pertaining to the "foreign dependents" in connection with the Workmen's Compensation Act, and jurisdiction are to be brought before the convention.

COMPANY NOTES

ASBESTOS MEETING.

The Royal Trust Company has made official announcement that a meeting of Amalgamated Asbestos bondholders will be held January 25.

PASSED ITS DIVIDEND.

The Temiskaming Mining Company has passed its quarterly dividend of 3 per cent.

DOMINION STEEL DIVIDEND.

A dividend at the rate of one per cent. upon the stock of the Dominion Steel Corporation, Limited, has been declared payable 2nd January, 1912, to shareholders of record 16th December instant.

NIPISSING STATEMENT.

The financial statement of the Nipissing Mines Company, as of December 9, shows: Cash on hand, $872,661; ore in transit, $144,934; ore at mine and ready for shipment, $403,885; total, $1,421,480.

TILT COVE COPPER.

The committee of management of the Tilt Cove Copper Company, Ltd., has declared an interim dividend of 6d. per share, free of income tax. The committee desires to point out that this dividend is based upon the profits for eight months—namely, from 31st December, 1910, to 31st August, 1911.

DOM. .COAL & N. S. STEEL OUTPUTS.

The Dominion Coal Company's shipments for the eleven months are 413,386 tons ahead of a year ago, while the N. S. Steel Company's coal shipments, due to the fire, are 79,011 tons behind. The figures for September and the eleven months follow:

Dominion Coal Co.

Shipments, November, 1911	297,131
Shipments, November, 1910	306,041
Decrease, November, 1911	8,910
Shipments, 11 months, 1911	3,385,127
Shipments, 11 months, 1910	2,971,741
Increase, 11 months, 1911	413,386

Nova Scotia Steel & Coal Co.

Shipments, November, 1911	74,310
Shipments, November, 1910	77,728
Decrease, November, 1911	3,418
Shipments, 11 months, 1911	686,623
Shipments, 11 months, 1910	765,634
Decrease, 11 months, 1911	79,011

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending December 15th, and those from January 1, 1911, to date:

	Dec. 15. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger		55,200
Bailey		40,000
Beaver	65,080	1,585,297
Buffalo	58,961	2,508,267
Casey Cobalt		261,265
Chambers-Ferland		1,300,900
City of Cobalt		727,980
Cobalt Lake	64,800	4,036,320
Cobalt Townsite	128,835	1,273,802
Colonial		227,910
Coniagas	63,254	291,164
Crown Reserve		2,049,829
Drummond	60,000	1,380,000
Green-Meehan		145,800
Hargraves	43,780	204,880
Hudson Bay	64,120	1,576,279
Kerr Lake		2,456,610
King Edward		40,000
La Rose	128,473	6,930,861
McKinley-Darragh	65,372	6,284,321
Nipissing		5,901,317
O'Brien		1,388,788
Little Nip.		58,430
Powerful		2,010
Provincial		202,050
Right of Way		1,336,025
Silver Cliff		106,680
Standard		102,813

Temiskaming		1,622,841
Trethewey		1,219,393
Wettlaufer		851,860

The shipments for the week were 742,675 pounds, or 371 tons, against 491 tons the previous week.

The shipments from Jan. 1 to Dec. 15 were 49,735,300 lbs., or 24,867 tons.

B. C. ORE SHIPMENTS.

The total for the week ended Dec. 2nd was 16,115 tons, making the total for the 11 months 1,407,139. The smelter receipts for the same periods were respectively 13,979 tons and 1,294,435 tons. The figures in detail are:

Slocan-Kootenay Shipments.		
Richmond-Eureka	26	2,087
Ruth	35	525
Rambler-Cariboo	61	1,533
Molly Hughes	9	62
Knob Hill	185	4,906
Molly Gibson	28	1,046
St. Eugene, milled	420	24,816
Queen, milled	420	19,850
Granite-Poorman, milled	250	12,010
Nugget, milled	110	5,280
Van Roi, milled	800	36,249
Other mines		33,982
Total	2,344	142,346
Rossland Shipments.		
Centre Star	3,727	182,798
Le Roi No. 2	389	26,749
Le Roi	399	16,730
Le Roi No. 2, milled	300	14,400
I. X. L.	8	97
Other mines		405
Total	4,823	241,179
Boundary Shipments.		
Mother Lode	7,590	289,235
Jack Pot	273	23,727
Athelstan	178	17,537
Unnamed	907	12,166
Other mines		680,949
Total	8,948	1,023,614
B. C. Copper Co.'s Receipts. Greenwood, B.C.		
Mother Lode	7,590	289,235
Jack Pot	273	23,727
Athelstan	178	17,537
Unnamed	907	12,166
Other mines		61,111
Totals	8,948	403,776
Consolidated Co.'s Receipts. Trail, B.C.		
Centre Star	3,727	182,798
Le Roi No. 2	389	26,749
Le Roi	399	16,730
Richmond-Eureka	26	2,087
St. Eugene, concentrates	32	6,415
Ruth	35	525
Rambler-Cariboo	61	1,533
I. X. L.	8	97
Queen	38	660
Molly Hughes	9	62
Knob Hill	185	4,906
Molly Gibson	28	1,046
Van Roi	94	1,528
Other mines		55,110
Totals	5,031	300,246

The total shipments from the Kootenay and Boundary districts for the week ended Dec. 9th, and year respectively to date, were 13,525 tons and 1,424,167 tons. The smelter receipts for the week were 14,424 tons, and for the year 1,309,957 tons. The figures in detail are:

Boundary Shipments.		
Mother Lode	7,222	296,457
Jack Pot	247	23,974
Athelstan	115	17,652
Unnamed	1,514	13,680
Other mines		681,251
Total	9,298	1,033,014
Rossland Shipments.		
Centre Star	3,623	186,421
Le Roi No. 2	226	27,075
Le Roi No. 2, milled	300	14,700
Le Roi	525	17,255
Other mines		502
Totals	4,674	245,953
Slocan-Kootenay Shipments.		
Sullivan	323	16,203
Richmond-Eureka	76	2,163
St. Eugene, milled	420	25,236
Silver Cup	30	472
Ruth	35	560
Emerald	39	1,842
Rambler-Cariboo	61	1,594
Queen, milled	420	20,270
Granite-Poorman, milled	250	12,260
Nugget, milled	110	5,390
Standard	138	529
Society Girl	34	554
Hope	26	642
Knob Hill	56	4,962
Van Roi, milled	800	37,049
Ethel	2	7
Sunset	12	20
Whitewater	21	21
Other mines		15,426
Totals	2,853	145,200
B. C. Copper Co.'s Receipts. Greenwood, B.C.		
Mother Lode	7,222	296,457
Jack Pot	247	23,974
Athelstan	115	17,652
Unnamed	1,514	13,680
Other mines		61,111
Totals	9,098	412,874
Consolidated Co.'s Receipts. Trail, B.C.		
Centre Star	3,623	186,421
Sullivan	323	16,203
Le Roi No. 2	226	27,075
Le Roi	525	17,255
Richmond-Eureka	76	2,163
St. Eugene	31	6,446
Silver Cup	30	472
Ruth	35	560
Rambler-Cariboo	61	1,594
Emerald	39	1,842
Standard	138	529
Society Girl	34	554
Hope	26	642
Queen	37	697
Knob Hill	56	4,962
Van Roi	31	1,550
Ethel	2	7

Sunset	12	20
Whitewater	21	21
Other mines		36,657
Totals	7,326	305,670

SILVER PRICES.

	New York. cents.	London. pence.
Dec. 6	55	25⅜
" 7	55⅜	25 9/16
" 8	55½	25⅝
" 9	55¼	25½
" 11	55	25⅜
" 12	55¼	25½
" 13	55	25⅜
" 14	55	25⅜
" 15	55⅜	25 9/16
" 16	55¼	25½
" 18	54⅞	25 5/16
" 19	55⅝	25 3/16
" 20	54½	25⅛
" 21	54⅝	25 3/16
" 22	54½	25⅛

TORONTO MARKETS.

Dec. 26.—(Quotations from Canada Metal Co., Toronto).
Spelter, 6.75 cents per pound.
Lead, 4.50 cents per pound.
Antimony, 7 to 9 cents per pound.
Tin, 45 cents per pound.
Copper, casting, 14.50 cents per pound.
Electrolytic, 14.50 cents per pound.
Ingot brass, 7 to 12 cents per pound.

Dec. 26.—Pig Iron.—(Quotations from Drummond, McCall & Co., Toronto):
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $18.50 (f.o.b. Toronto).
Midland No. 2, $18.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Dec. 22.—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $1.75 per ton.
Foundry coke, prompt, $1.90 to $2.00 per ton.

Dec. 22.—Tin, Straits, 44.85 cents.
Copper, Prime Lake, 14.12½ to 14.25 cents.
Electrolytic copper, 14.10 to 14.20 cents.
Copper wire, 15.25 cents.
Lead, 4.45 to 4.50 cents.
Spelter, 6.40 cents.
Sheet zinc (f.o.b. smelter), 8.25 cents.
Antimony, Cookson's, 7.87½ cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.

SHARE MARKET.

(Courtesy of E. D. Warren & Co.)

NEW YORK CURB.

December 20th, 1911.

	Bid.	Asked.
Braden	5¾	5⅞
B. C. Copper	4¼	4½
Butte Coal	22	22⅛
Ely Central	.03	.05
Ely Cons.	5/16	⅞
First National	1¾	1⅞
Giroux	4 9/16	4 11/16
Greene- Canadian	8	8¼
Inspiration	10	10⅛
Nevada Hills	2 5/16	2⅜
Ohio Copper	1	1⅛
Ray Central	1⅞	1 15/16
Yukon Gold	3⅜	3½
Union Mines	..	..
Goldfields Cons.	4⅞	5
Nevada Cons.	19⅛	19¼
Miami	23⅜	23½
Granby	28	60
Cons. Mining & Smelting	43	46
Davis-Daly	13/16	15/16
Cons. Arizona	½	9/16
Rawhide Coal	..	..
Ray Cons.	17⅞	18
Chino	25⅜	25½
New Baltic	..	..
United Copper	1⅝	1⅞

COBALT STOCKS.

Bailey	.02	.02¼
Beaver Consolidated	.40½	.41
Buffalo	..	..
Chambers-Ferland	.10	.12
City of Cobalt	..	..
Cobalt Lake	.24½	.30
Coniagas	..	..
Crown Reserve	2.93	3.00
Great Northern	.09½	.11
Hargraves	..	..
Hudson Bay	..	..
Kerr Lake	2.75	3.00
La Rose	3.97	4.02
McKinley	1.67	1.70
Nipissing	7.00	7.12½
Nova Scotia	..	..
Peterson Lake	.05⅞	.06¾
Right of Way	off	.07¼
Temiskaming	.30	.31
Trethewey	.63	.70
Wettlaufer	.83 bid	
Little Nip.	.01½	.02
Green Meehan	.01¼	.02⅛
Rochester	.02	.02½
Silver Leaf	.03	.03¼

PORCUPINE STOCKS.

American Gold	1.08	1.08½
Apex	off	.10
Coronation	..	..
Nor. Exploration	..	..
Dobie	.75	1.05
Dome Ex.	.60	.61
Foley-O'Brien	.46	.52
Rea	1.50	1.53
Hollinger	13.70	13.75
Monita	.10	.14
Pearl Lake	.37	.44
Central	3.25	3.30
Imperial	.05½	.06½
Northern	.62	.63
Tisdale	.02½	.04
Preston East Dome	.11½	.11¾
Standard	.11½	.12
Swastika	.20	.20½
United	.02½	.02⅞
Porcupine Gold	.57¾	.59
West Dome	..	..
Crown Chartered	.51	.52
Eldorado	.09½	.10½
Gold Reef	off	.18
Porcupine Canada	.85	1.00
Jupiter	.49½ bid	
Achilles	.33 bid	
Porc. South	.61	.62

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Achromatic Terrestrial Telescope, 9 inches; objective glass, 1⅛ inches aperture, with dust cap, sunshade and dust protector to object slide. Improved achromatic eye piece with spiral motion for focussing cross hairs. Stadia Wires. Graduated Level Vial to Telescope. Clamp and Tangent screw to Telescope with counter spring. Vertical circle 4½″ graduated to half degrees and numbered in quadrants, Vernier reading to one minute. Compass Needle, 3-1-8″ long. The compass is provided with variation plate, set by Capstan head pinion. Horizontal limb, 5-1-8″ graduated to half degrees and reading to one minute by two opposite Verniers placed at an angle of 30° to line of sight. The graduation has two rows of figures reading in opposite directions from Zero to 360°. Two Spirit Levels to horizontal limb, graduated on the glass, Clamp and Tangent screw with opposing spring. Long independent centre, four leveling screws, ⅝″ shifting centre. Weight of instrument without Tripod 9½ lbs.

Instrument complete in Mahogany finished box, with plumb bob, reading glass, adjusting pins, etc. Extension tripod. **$157.50**

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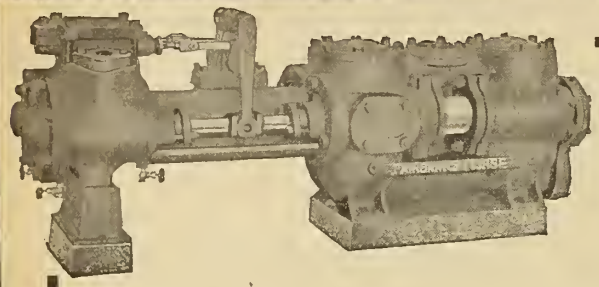

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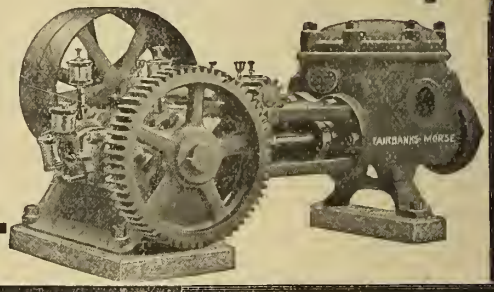

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

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1064. Geology of an area adjoining the east side of Lake Timiskaming, by Morley E. Wilson.

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WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

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Leases for three renewable terms of twenty years each can be obtained for $50., and are subject to a yearly rental of $30.

Royalties are as follows:—

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Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. W. H. HEARST,
Minister of Lands, Forests and Mines,
Toronto, Canada.

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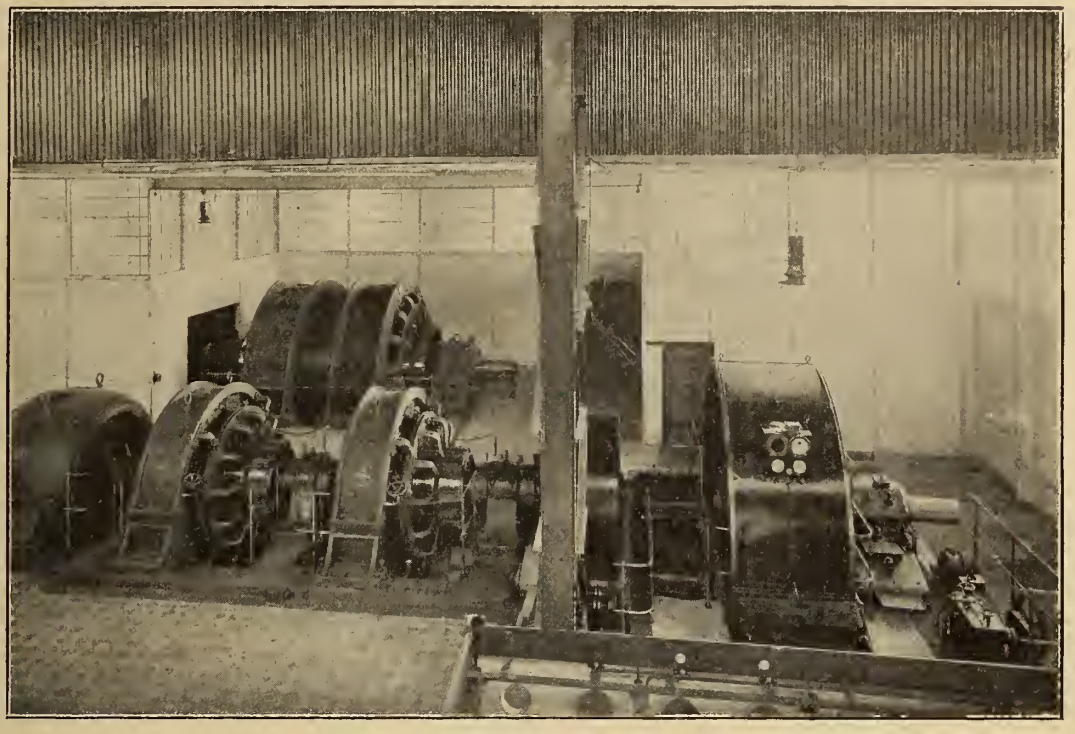

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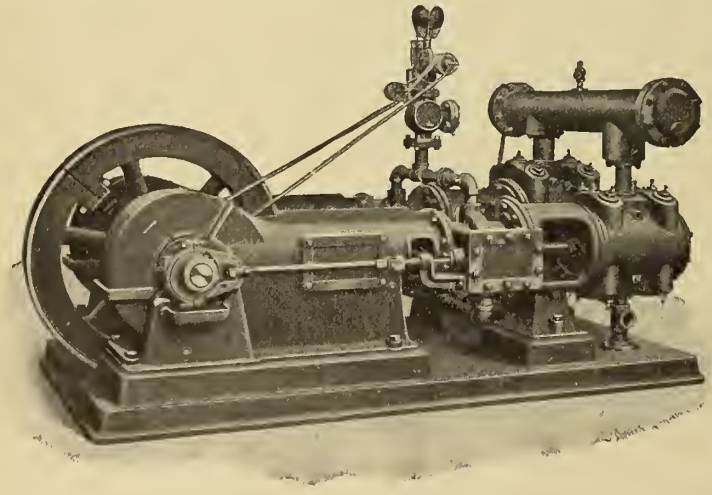

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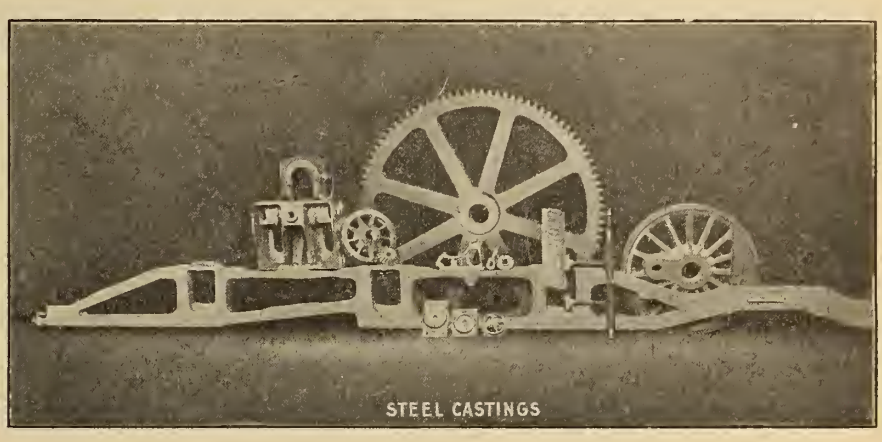
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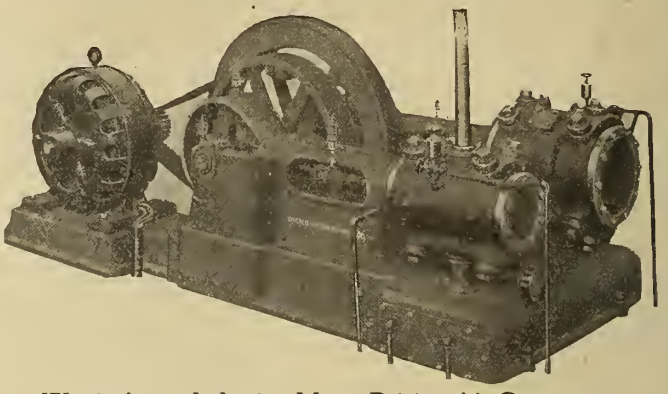

Westinghouse Induction Motor Driving Air Compressor

placed conveniently near the point of application of the air and thus avoid long and complicated systems of piping, necessary with steam-driven units.

Westinghouse Motor-Driven Air Compressors are in every way more economical and eliminate all of the many objections to steam-driven compressors

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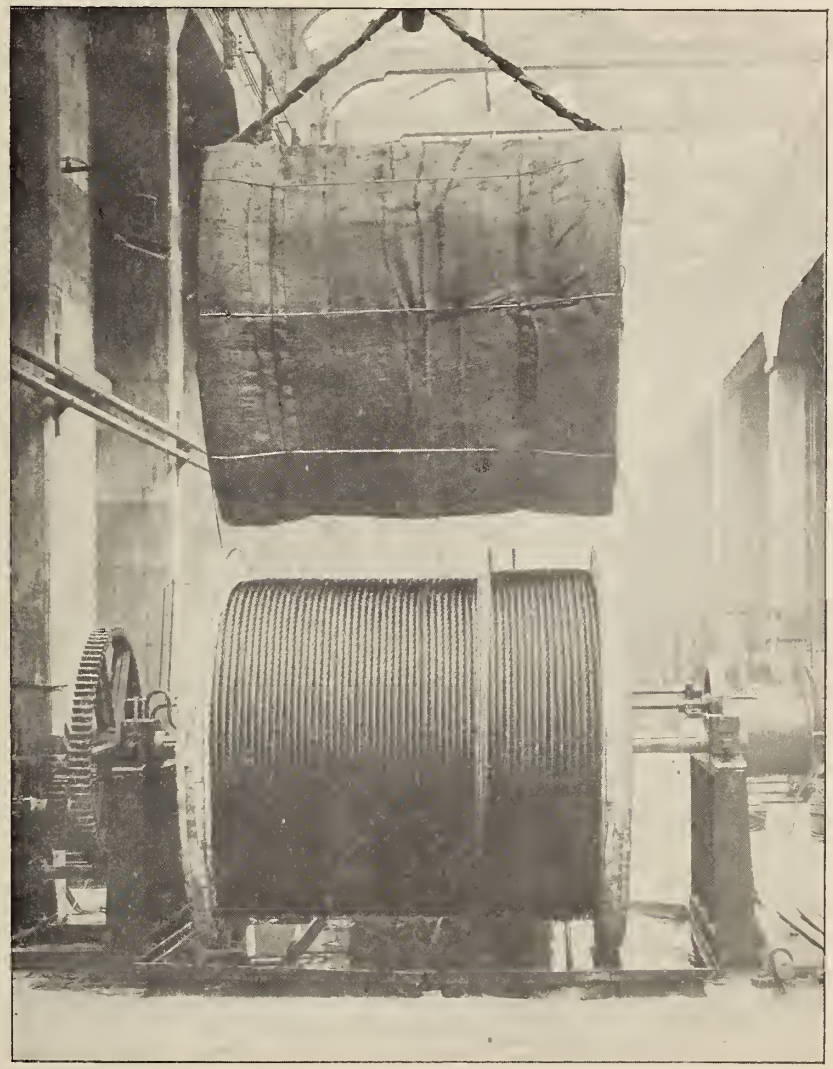

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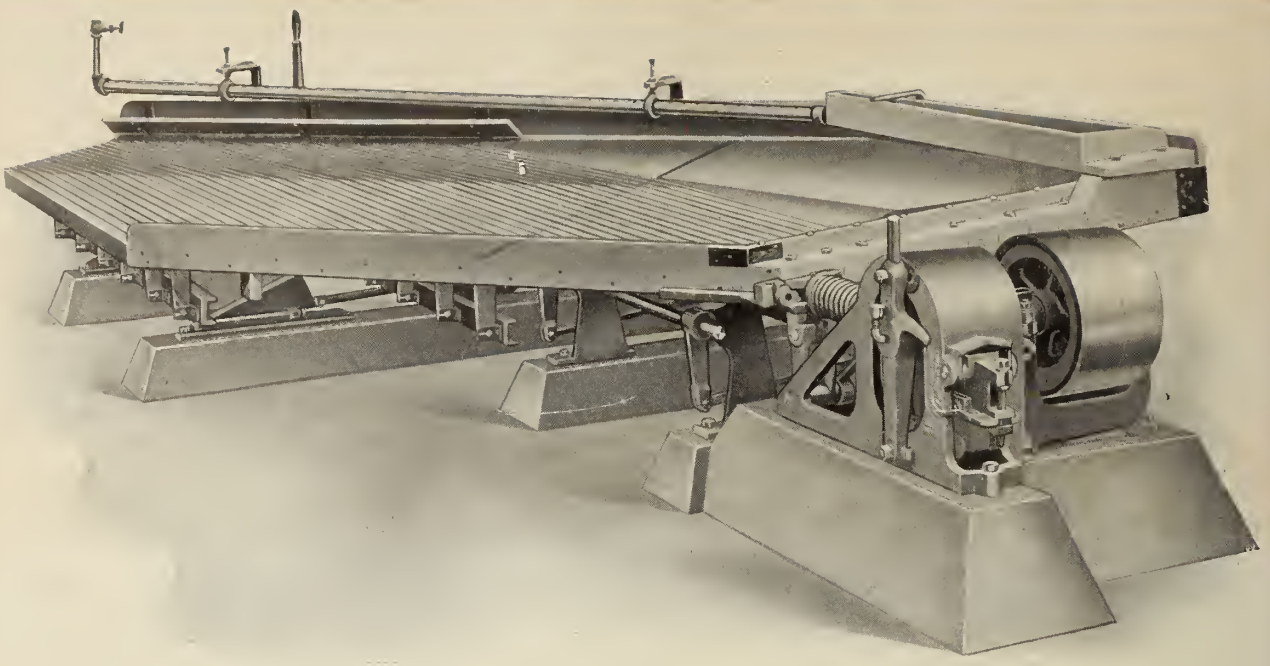

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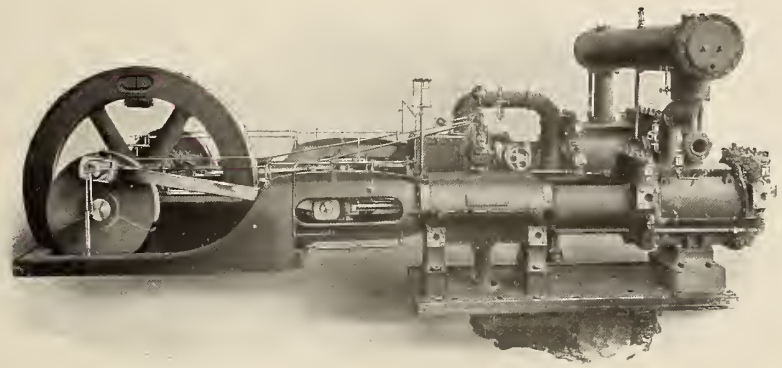
THE CANADIAN MINING JOURNAL

. 33 TORONTO No. 2

LAIDLAW DUNN GORDON AIR COMPRESSORS



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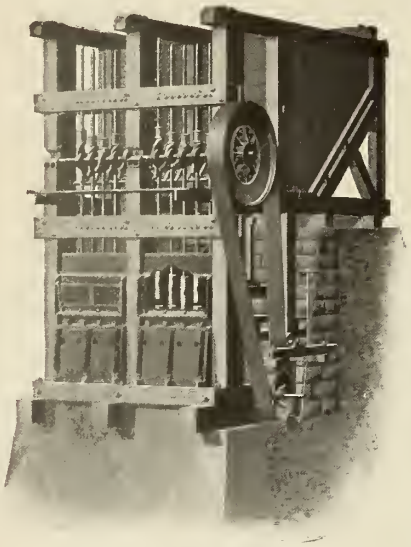
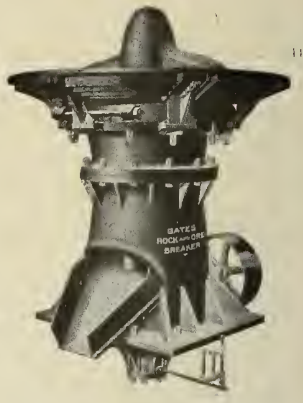
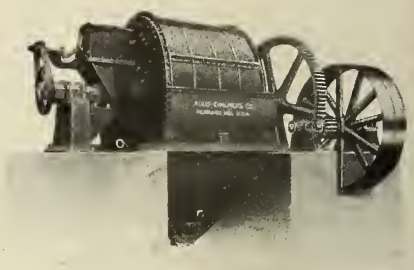


Stamp Mills
See Bulletin 1432

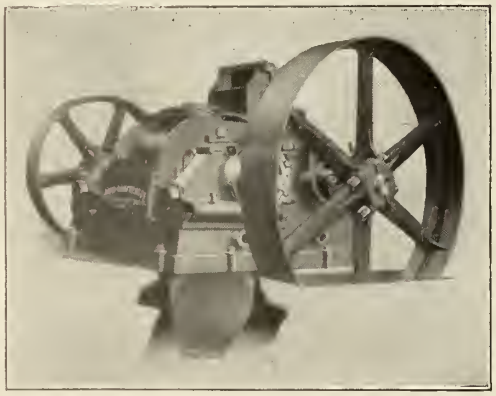
Gates Elevators
See Bulletin 1411



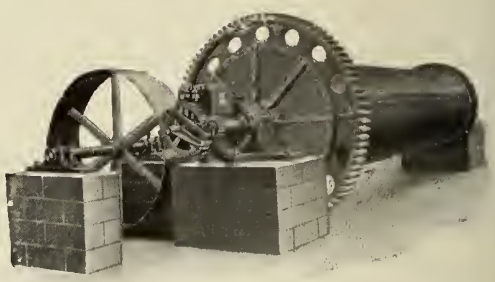
Gates "K" Breaker
See Bulletin 1448



Ball Mills
See Bulletin 1444



Crushing Rolls
See Bulletin 1412



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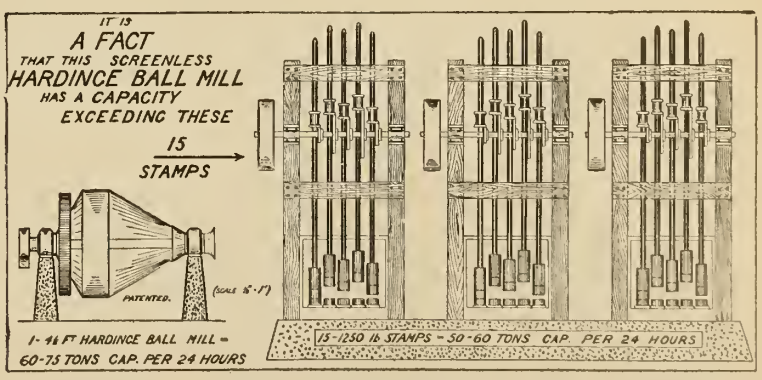

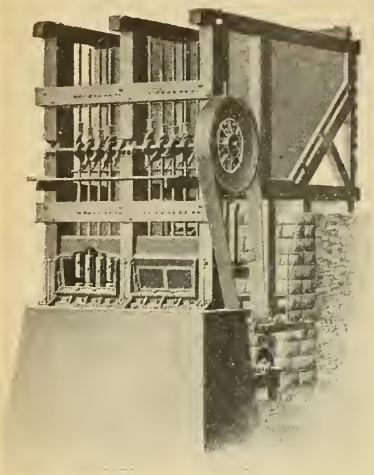

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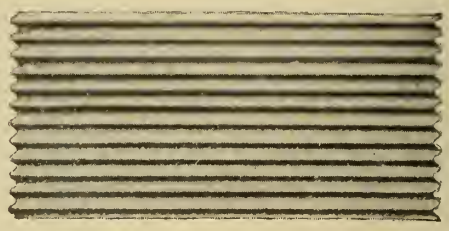

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CATALOGUE 655

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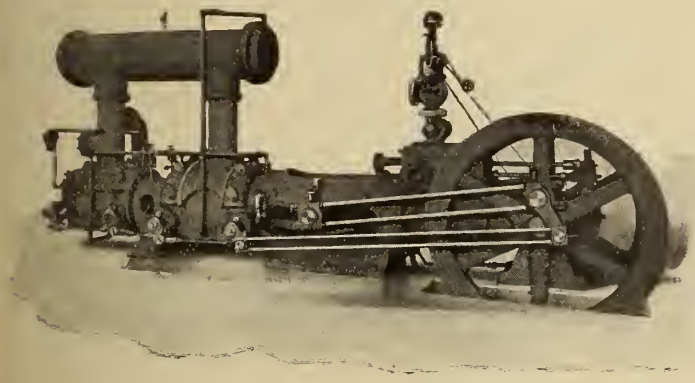

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This steam valve mechanism is second only to the drop release Corliss type.

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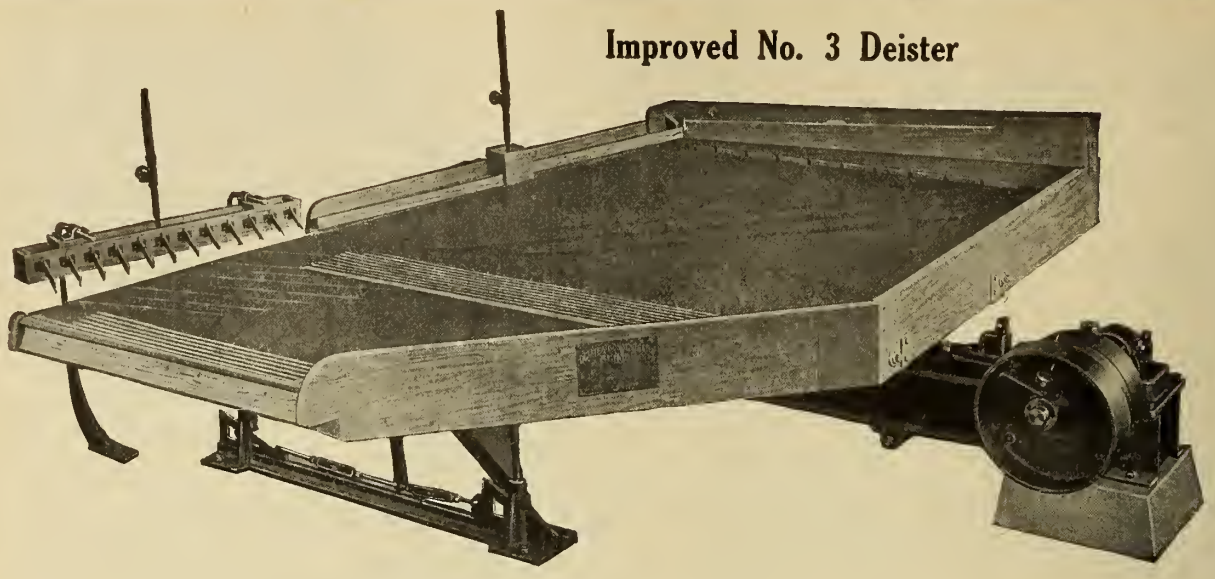

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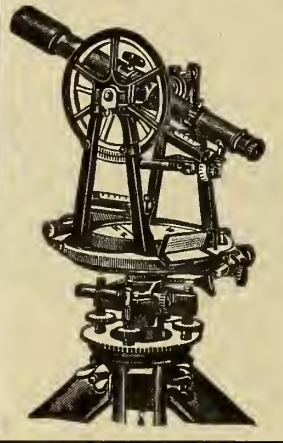

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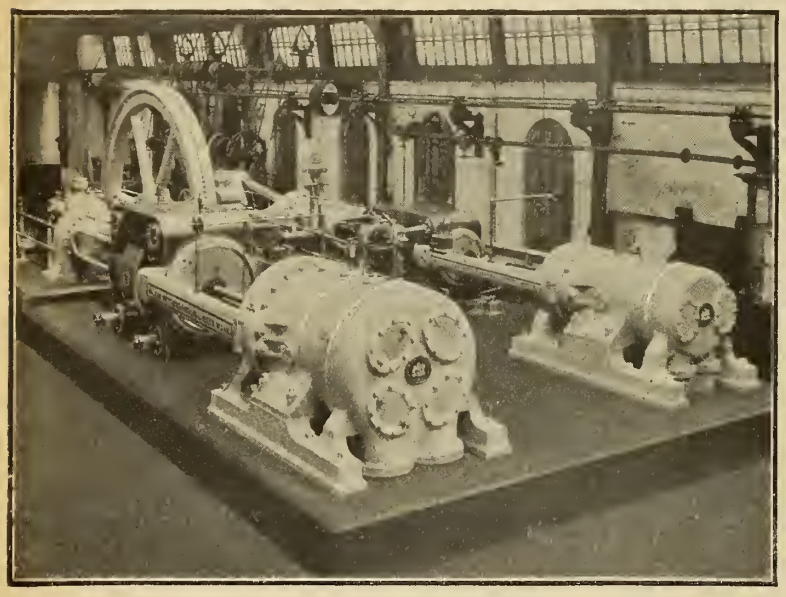

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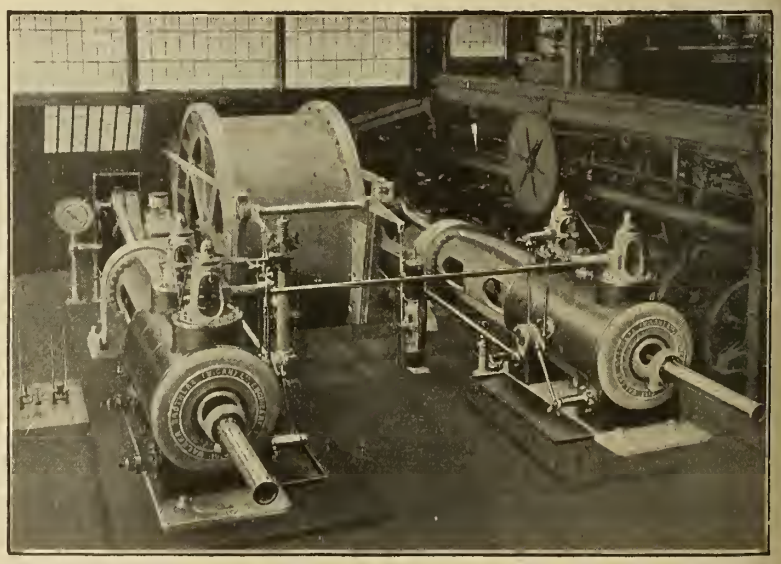

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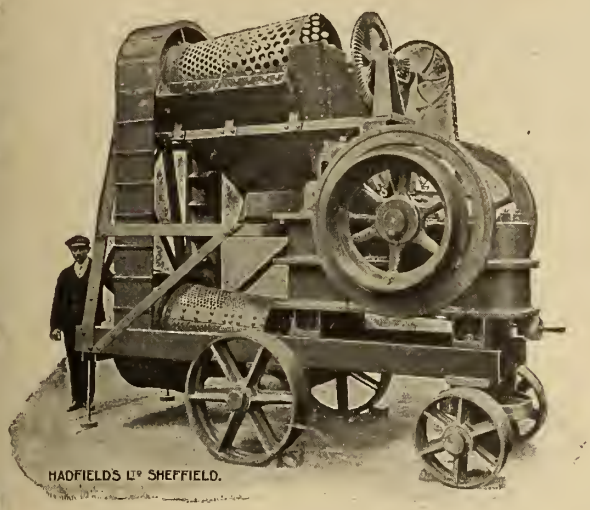

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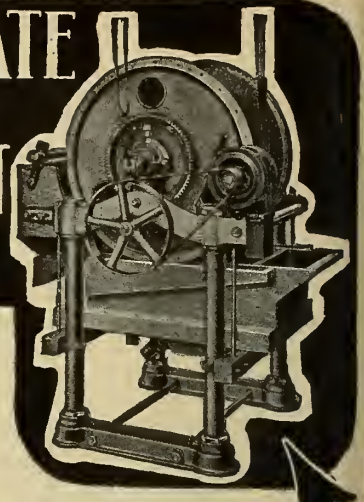

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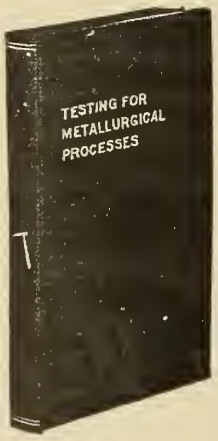

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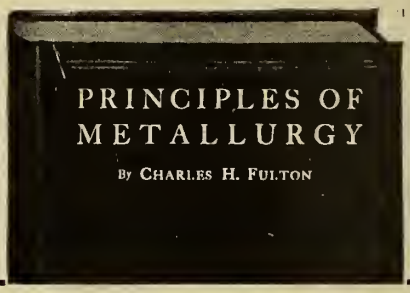

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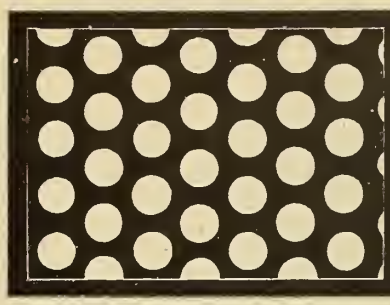

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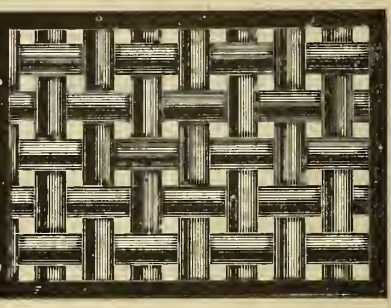

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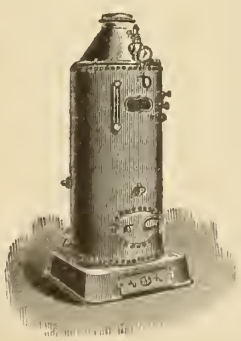

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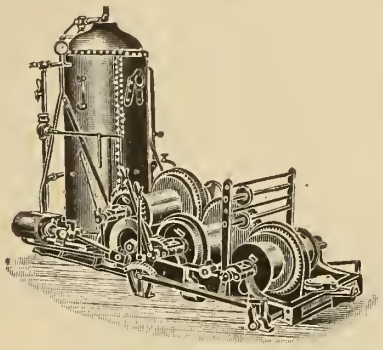

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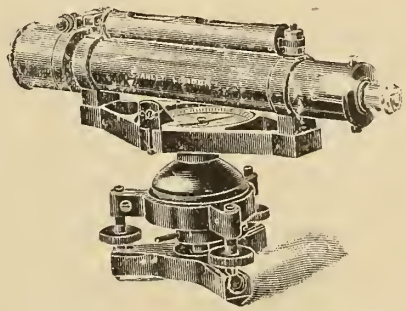

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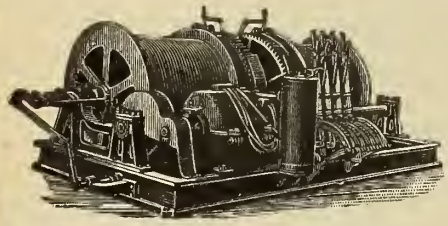

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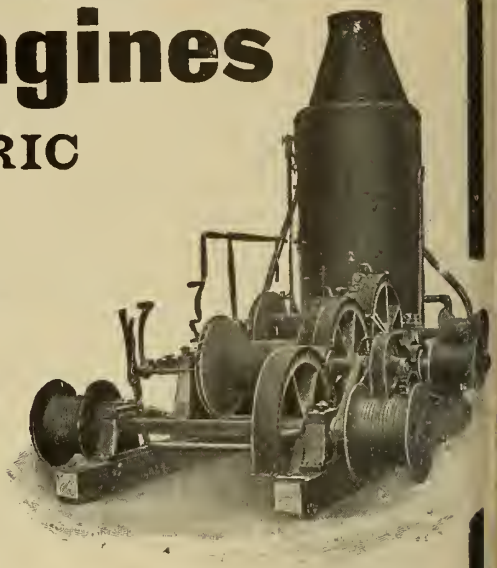

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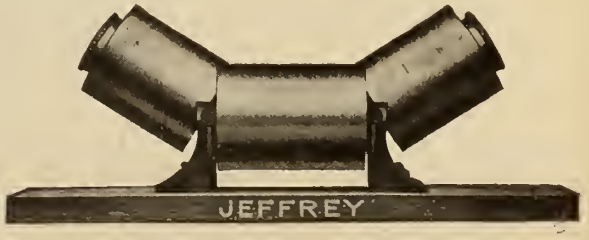

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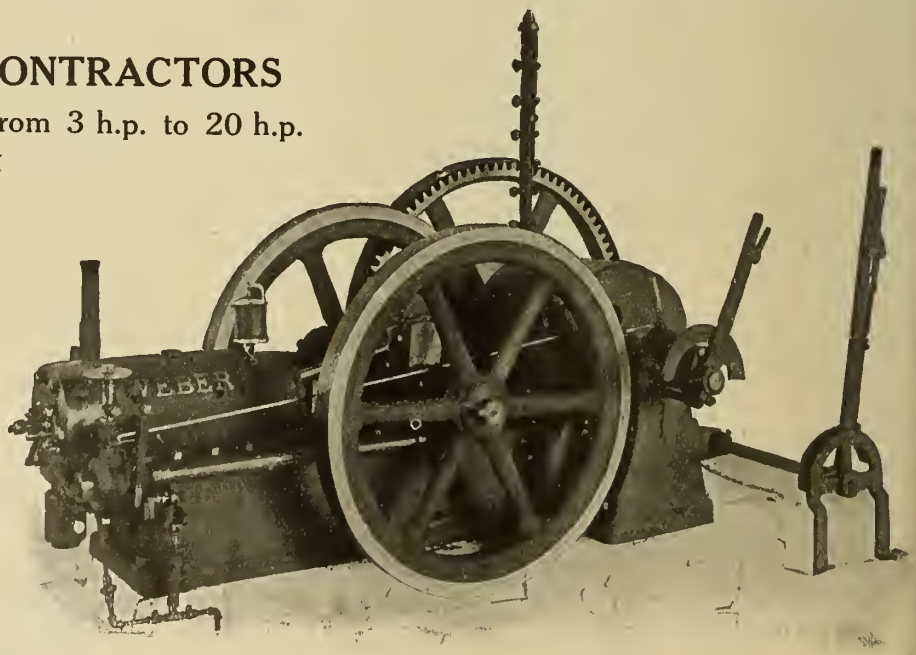

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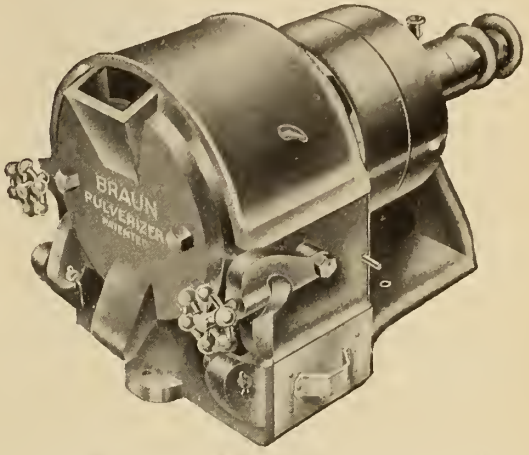

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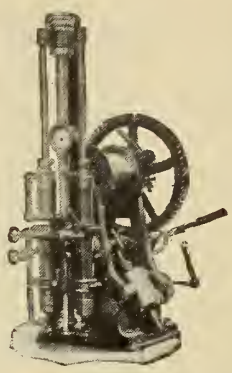

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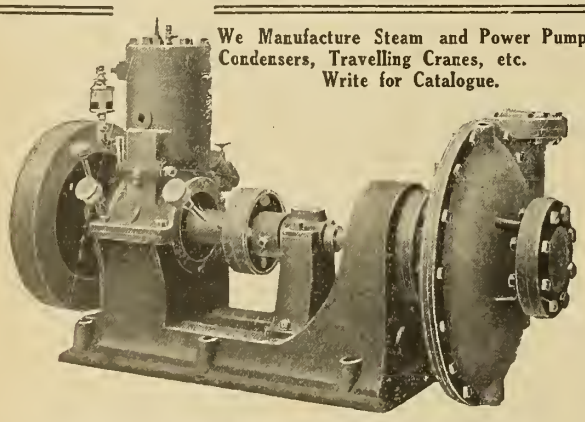

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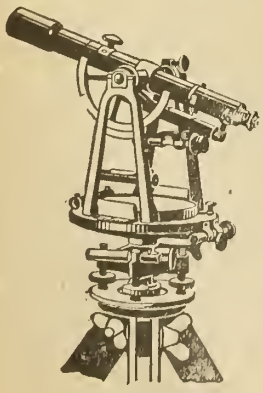

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, Jan. 15, 1912. No. 2

The Canadian Mining Journal

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A WORD OF APPRECIATION.

Often it has been our painful duty to comment harshly upon the nonsense published by Canadian newspapers concerning mining. It is pleasant, therefore, to have the opportunity of saying a few words in appreciation of the efforts of several daily journals.

Three Canadian dailies, one in Nova Scotia, one in Ontario, and one in British Columbia, issue regularly at the beginning of the New Year, special reviews of annual progress. The Toronto Globe's articles on mining in the supplement to its January 1st issue are decidedly the best that have ever appeared in its columns. In the Halifax Morning Chronicle, for the same date, there were excellent resumes of mining in Nova Scotia. The Nelson Daily News, which is not yet to hand, has for some years favoured the public with exhaustive articles from the pen of Mr. E. Jacobs.

To these papers, and to several others in Ontario and British Columbia (and here it is not invidious to mention the Cobalt Nugget and the Porcupine Press), the investor and the miner owe a great deal. It is not easy for the daily newspaper to sift closely the true from the false in dealing with despatches from mining camps. But it is desirable and practicable to engage only well-informed writers to contribute to its columns. The three newspapers mentioned have chosen the best available authorities.

A few weeks ago the Canadian Mining Journal won the disapproval of its vigorous contemporary, the Toronto Saturday Night, for venturing to suggest that the mining industry needed more publicity. Our critic evidently mistook the point of our suggestion.

There is nothing more beneficial than timely publicity. This has nothing to do with the touting of flotations. The publicity that is desirable is just such as that given to the industry of mining in the annual reviews referred to above. But this can be carried much further. We believe that it is the duty of the mine manager, not alone to see that no exaggerated or false items concerning his mine get into the papers without prompt contradiction, but also to undertake to give the investing public exact and regular information. Naturally, this does not hold for the manager of a mine that is privately financed. In these circumstances the manager can rightly withold all facts. But when the shares of any mining enterprise are being openly traded, the manager who permits falsehoods to be circulated, either to the detriment of the mine or otherwise, is morally culpable.

Hence there is pressing need of some general arrangement whereby succinct reports of the physical condition of all important mines be given out regu-

larly. This is done in South Africa on a very large scale, and all over the world where responsible capitalists control operations. It is the one and only cure for the lamentable conditions that prevail in our stock exchanges. As a matter of fact, Canadian mining exchanges have become such hotbeds of unholy doings that special legislation is being seriously considered by the proper authorities. Legislation, however drastic, will be of no avail. The disease is deep-seated. The remedy lies in the hands of the mine owners and mine managers.

To become more specific, there are dozens of Porcupine promotions of which nothing is known beyond the eloquence of a prospectus. Think for a moment what a readjustment of share values there would be were the managers instructed to publish monthly statements covering the work done and the value of ore developed!

And there is absolutely no good reason why this should not be done. If an enterprise cannot bear the light of day who on earth wishes to put his money in it? To which it can be answered that the industry and the profession of mining are being made subservient to groups of speculators that they may profitably carry on a huge game of poker—with marked cards!

THE GEOLOGICAL SURVEY AND THE MINES BRANCH DURING 1911.

Both Branches of the Department of Mines, Ottawa, did vigorous work during the past twelve months. In this number of the Canadian Mining Journal will be found specially written accounts of the labours of each.

The officers of the Survey covered much ground. The summer's record included a geological reconnaissance across the Rocky Mountains; a palaeontological study of Carboniferous rocks on the shores of Chignecto Bay, Nova Scotia; a close inspection of part of the Alaska-Yukon boundary; an investigation of the Tulameen (B.C.) diamonds; a detailed examination of the area surrounding and including the West Shining Tree district, Ontario; the mapping of the coal area situated where the Grand Trunk Pacific crosses the Rockies; a further examination of the gold bearing series in Lunenburg and Queens counties, Nova Scotia; an investigation of deposits of clay and shale in various parts of Canada; a study of one hundred square miles in the vicinity of Nelson; the completion of a geological study of the Portland Canal district; the examination of typical mica, graphite, and apatite deposits in Quebec, and the investigation of the petroliferous and gas-bearing region south of Moncton, New Brunswick. In addition several parties were assigned special stratigraphical and topographical duties, and the divisions of Natural History and Anthropology continued their regular tasks.

The Survey moved during the year into more commodious quarters in the new Victoria Memorial Museum. The old quarters had long outlived their usefulness. It is now possible to exhibit to some advantage the collection of specimens that has been accumulating for years.

The protracted illness of the Director, Mr. R. W. Brock, interfered somewhat with the work. Nevertheless the season has been successful.

Sporadic attempts have been made to continue the publication of regular press bulletins. This duty should devolve upon a specially appointed officer. It is well to keep the public informed.

The Mines Branch, which, as we have mentioned before, is now settling down to its proper work, undertook several new investigations, besides continuing those commenced before 1911. Material was gathered during the year for monographs on the Sudbury nickel-copper deposits; and on the salt and gypsum industries; on Canadian feldspar and phosphate deposits. Most important of all, the Canadian market for certain mineral commodities was looked into thoroughly. The results of this last-mentioned mission will be of great commercial interest. We predict that this is but the beginning of a campaign that will lead to large industrial developments.

The testing of processes, especially methods of concentrating iron ore and of utilizing peat, was continued vigorously. Plans were made and a site secured in Ottawa for a large testing station where explosives will be tested, and all the phenomena connected with coal-mine explosions investigated. Here, also, the use of the rescue apparatus will be demonstrated. This establishment will be of great importance in bringing before the mine owner modern methods of preventing the loss of life in mines.

* * * *

The Geological Survey and the Mines Branch are institutions that deserve the support and encouragement of every citizen. They are, as they should be, as non-political as frail human nature can make them. Both are assisting in building up the nation. Both strive to educate the people; to help the prospector, the miner, and the investor; and to advertise abroad the resources of Canada. The usefulness of both is limited by totally insufficient appropriations of money. We look to the present Government to correct this needless evil.

EXIT HAWTHORNE.

Justice bids fair to overtake that most picturesque of mining promoters, Julian Hawthorne. The United States Post Office Department has been on his trail for some time. On the afternoon of January 5th Hawthorne; Josiah Quincy, ex-Mayor of Boston; Albert Freeman; John McKinnon; and Dr. William J. Morton were indicted in New York on the charge of using the mails in a scheme to defraud investors in certain mining enterprises.

THE TORONTO WORLD

...on Favors Higher Prices

JULIAN HAWTHORNE

Well-Known Author, Has Entered the

Montreal River District on a Large Scale

Hawthorne Syndicate owns the Temagami-Cobalt Mines, Limited, The Elk Lake-Cobalt Mines, Limited, and The Montreal-James Mines, Limited, and is now branching out into the Shining Tree Lake and Welcome Lake districts.

It has, for some time past, been known to The World, and possibly also to the better-informed portion of the Toronto public, that Mr. Julian Hawthorne has been writing to friends of his in the States, inviting them to join him in a mining project in Ontario. Not until to-day, however, has full and trustworthy information on the subject been received.

This is due to the fact that, for reasons best known to themselves, Mr. Hawthorne and his associates have been conducting their operations very quietly; at any rate, they have thus far avoided publicity. So no mention of their proceedings has been made, and it was, indeed, by the merest accident that The World became possessed of the information.

THE TEMAGAMI-COBALT MINES PROPERTY.

The fact is, that the Hawthorne Syndicate has entered Ontario on a scale which might be described as stupendous. It is stated that the Syndicate, some time last September, started operations on a [illegible] is known as the Diabase Peninsula [illegible] White Be[illegible] within two [illegible] miles [illegible] Temagami railw[illegible] T[illegible] wre[illegible] in- piece of the [illegible] been unco[illegible] line [illegible]

...has ...been ... the Welcome ... district, ...ut an area ...ually large. It is reported that they have recorded more than 100 claims (4000 acres) in that district alone.

BRAINS, PUSH AND MONEY.

From these data it would seem that the Hawthorne Syndicate is backed, not only by pluck, energy and foresight, but by no end of money as well. For operations on a scale such as theirs require big money, and when it is realized that the money they are spending is their own, and that they are not organizing stock companies, it will be understood that it means, on their part, deep-rooted confidence in the future of the Ontario silver zone. For mining of this sort, The World is free to say that it entertains high respect. We deem it more than probable that American pluck and push are going to win out once more. The members of the Hawthorne Syndicate are people of the kind that makes history; and we should not be surprised if, in this instance, they made money, too.

Supplies have been forwarded for two camps of one hundred men—one camp at Shining Tree Lake, the other at Welcome Lake. As soon as the snow melts, the Hawthorne Syndicate will begin systematic prospecting of their immense holdings. It is certainly remarkable that, until now, nothing has been known of the operations of these men. If nothing else had drawn attention to them, it would be thought that the amount of machinery and supplies going into their properties would have done so. However, The World at last presents the facts.

All of the accused pleaded "not guilty." Bail to the amount of $25,000 was demanded of Freeman, and $10,000 each for his associates.

It is alleged by the Post Office Department that the defendants received nearly three and one-half million dollars from sales of shares in the Temagami-Cobalt Mines, Limited; the Elk Lake-Cobalt Mines, Limited; the Montreal-James Mines, Limited; and the Hawthorne Silver and Iron Mines, Limited. Astonishing as this may seem, it is probably well within the truth.

That Mr. Julian Hawthorne has been, or is now, the head and front of the offenders is not likely. He has, of course, prostituted his literary talents — talents never of a high order — to the basest uses. But he has been a mere puppet, albeit a very willing puppet, in the hands of clever and unscrupulous promoters.

Several times has the Canadian Mining Journal exposed Julian Hawthorne. It is of historic interest to recall one of the first incidents.

In our issue of April 15th, 1909, there was reproduced from the Toronto World a glaring advertisement of the Temagami-Cobalt Mines, Limited. These reproductions are given herewith.

Our readers will perceive that the Toronto World fully endorsed all of Hawthorne's statements. They will notice, moreover, one prophetic sentence: "The "members of the Hawthorne Syndicate are people of "the kind that makes history; and we should not be "surprised if, in this instance, they made money, too." The "we" stands for the Toronto World.

Let us reproduce here, also, part of an editorial paragraph of our own, leaving out several unkind references to the Toronto World:—"Julian Haw- "thorne, unworthy son of worthy Nathaniel, is a "magazine writer. He is also a sublimated ass. More- "over, he has been shown up by one or two responsible "mining journals in the United States. In fact, he is "so patently a pretender that we do not wish to waste "more space upon him."

In the interests of decency we hope that the United States authorities will spare no pains to investigate fully all the Hawthorne flotations. This should have been done in Canada long ago. Our mails are sewers of corruption.

THE GEOLOGICAL SOCIETY OF AMERICA.

The Annual Meeting of the Geological Society of America, which includes in its membership practically all the geologists of Canada as well as of the United States, was held at Washington on the 27th, 28th, and 29th of December.

Canada was well represented. Amongst the delegates from this side of the line were Dr. F. D. Adams, Dr. A. E. Barlow, Messrs. Brock and Cairnes of the Geological Survey of Canada; Dr. W. G. Miller and Mr. Knight, of the Ontario Bureau of Mines; Professors Coleman, Walker, and Parks, of Toronto University; Professors Baker and Nicol, of the Kingston School of Mining; and Messrs. Tyrrell and Ferrier, of Toronto.

Of the papers read, several were of special interest to Canadians. These were: "Pre-Cambrian Formations in South-Central British Columbia," by Professor R. A. Daly; "Occurrence of Petroleum Associated with Faults and Dikes," by Frederick G. Clapp; "Progress of Opinion as to the Origin of the Iron Ores of the Lake Superior Region," by N. H. Winchell; "Glacial Investigations in Minnesota in 1911," by Frank Leverett; "Recent Studies of the Moraines of Ontario and Western New York," by Frank B. Taylor; "Differential Erosion and Isoplanation in Portions of Yukon and Alaska," by D. D. Cairnes; "Oscillations of the Land Round Hudson Bay," by J. B. Tyrrell; and two papers by C. D. Walcott, "Middle Cambrian Crustaceans from British Columbia," and "Fossils from the Huronian Rocks near Steep Rock Lake, Ontario."

On the evening of December 28th, the annual dinner was held at the Ebbitt House. About 225 were present. Dr. Clarke, of Albany, was Toastmaster. To illustrate his introductory speech he displayed a number of sensational lantern slides. One of these represented the Directors of the Geological Surveys of Canada and the United States resting amicably together on a seashore, while Mr. Taft and the Rt. Hon. Mr. Borden were standing in the distance in attitudes anything but peaceful. This effort was entitled "Reciprocity." Another picture portrayed Dr. Adams as a redoubtable mountain climber. A third showed a New York professor of geology as Mona Lisa! Thus is the spirit of good-fellowship preserved. Dr. Adams and Mr. Brock were among the principal after-dinner speakers.

On the evening of the 29th, the retiring president, Professor W. M. Davis, of Harvard, delivered an address on the "Relations of Geography to Geology." The address was followed by a smoker, presided over by Dr. E. W. Parker, of the U. S. Geological Survey.

Each session, and the meeting as a whole, were profitable and enjoyable. It may be suggested, however, that the prevailing tone of all the papers read is too highly academic. An occasional co-ordination of the economic and the abstrusely scientific would prove beneficial. It is true that the Canadian Mining Institute and the American Institute of Mining Engineers absorb most of the technical and practical papers. Yet there should be no difficulty in obtaining from many of the members of the Geological Society papers that at least overlap mining. If this be not done there will be grave cause to fear intellectual Pharisaism and dry-rot. The academic mind is prone to isolate itself, and to take itself far too seriously. The modern geologist, to live up to his high calling, must know where and how his studies and researches fit into the scheme of real life.

Hence we suggest, respectfully, that at the Society's next Annual Meeting there be presented a saving number of economic topics. Not only will this be salutary,

but it will also tend to rouse public interest. It must not be forgotten that the public, even the mining public for whom geology was made, always shies at ponderous and paralyzing polysyllables. Is it not practicable for the geologist to smite his fellow with a 12-inch concatenation of sounds, without neglecting the lay mind?

We remember well Dr. Kemp's address before the Canadian Mining Institute, an address remarkable for its simplicity and its practical meaning, in which he showed how the geologist had saved the Corporation of the City of New York hundreds of thousands of dollars by controlling the tunnelling, the excavating, and the general course for the city's new water supply. Material of this kind is needed by all of us. Let us have more of it.

THE WORLD'S PRODUCTION OF IRON AND STEEL.

While the world's total output of iron ore in the year 1909 was about 130,000,000 tons, an amount 2½ per cent. below that of the year 1907, all available returns indicate that the output in 1910 was considerably higher than that of 1907.

The world's production of pig iron during 1910 amounted to about 65,000,000 tons, the United States contributing 27,300,000 tons; Germany, 14,556,000; Great Britain, 10,000,000 tons; and France, 3,970,000 tons.

By far the greater part of all the pig-iron produced is manufactured into steel. From the records of the last five years it is learned that Great Britain converts 56 per cent. of her pig-iron into steel; the United States, 74 per cent.; Germany, 76 per cent; France, 64 per cent.; and industrious Belgium, about 83 per cent.

A rough estimate of the world's steel production places it at 59,000,000 tons. Of this quantity, Great Britain, Germany, and the United States account for about 46,000,000 tons, or 78 per cent.

Of all iron ore producing countries, Sweden has considerably the largest per capita annual output, returns showing that nearly one ton of ore is mined per head of the population. Comparing this with other countries, we find that in the United States the corresponding figure is about three-fifths of a ton per head; in Germany, above two-fifths; and in Great Britain about one-third of a ton.

It is worthy of note that Great Britain has not only dropped behind in the race, but that her annual tonnage of iron ore has fallen from a maximum of over 18,000,000 tons in the year 1882, to about 15,000,000 tons for 1910. Germany has outstripped her; but the United States output continues to exceed that of both Great Britain and Germany combined.

Another feature of importance is the fact that Great Britain exports more pig iron than all other countries combined. Her average yearly exports during the last five years were 1,443,000 tons, or 15 per cent. of the total British production. Unquestionably this heavy export trade has been built up partly because of the conservatism of the British in adopting modern methods of steel-making; and partly because of the high quality of Scotch and English foundry pig-irons. It seems to imply, however, an avoidable industrial loss.

* * * *

In reviewing figures and facts like those above, the curious mind will begin speculating upon Canada's future. How long will our iron industries require artificial stimulants? Is not a tariff wall a wiser and safer expedient? Why are not our railroad magnates and our iron-masters conspiring to exploit domestic ore deposits? Why is the whole industry at the mercy of politicians? Other questions rise. When will they all be answered?

Our iron and steel industries are the product of private enterprise, sometimes aided and often crippled by governmental interference. Official help, to be effective, should be definite, carefully applied, and not dependent upon the vagaries of Ottawa. Canada has all the essentials that go to make up the basic industries of iron and steel making. So far the mountain has brought forth only a sickly mouse.

EDITORIAL NOTES.

Two years ago the Western Branch of the Canadian Mining Institute requested the Dominion Government to admit free of duty all mine-rescue apparatus. This request was not complied with. At present these devices are dutiable. They are classed as mining machinery. To obtain a refund of the duty, a long process of red tape is necessary. Why rescue apparatus cannot be classified properly and put on the free list is not apparent, which is more than can be said of the stupidity of the authorities at Ottawa.

The White Pass and Yukon Railway Company is one of the large factors in the development of northern British Columbia, southern Alaska, and Yukon territory. At the annual meeting of the company, held last month in London, Mr. O. L. Dickeson, the general manager, alluded to the intention of the company to supply Yukon dredging companies with fuel oil to take the place of the diminishing and costly wood supply. Mr. Dickeson also referred to certain promising quartz veins that are being opened up in the Taku Arm district, between Caribou and Atlin, and informed the meeting that the White Pass and Yukon Company had assisted the citizens of Skaguay in the promotion of a sampling mill. Low freight rates are charged for handling sample shipments, and the charges at the mill are brought down to actual cost. In these and in other ways the Company is doing much to encourage the prospector and the miner.

The new Civil Service Commission should not neglect to consider at an early date the practicability of increasing the salaries of technical officers on the staff of the Ottawa Department of Mines. To advertise for experienced engineers, offering a salary of $1,800, is a cruel farce.

In formal business phraseology the cable announcement came on New Year's Day that the firm of Wernher, Beit & Co., had been dissolved by mutual consent. Wernher, Beit & Co. made history in South Africa. The firm made many millions there and put millions back. Mr. Otto Beit, the brother and heir of the famous Alfred Beit, is enormously wealthy. His former partner Sir Julius Wernher, is also amply blessed with this world's goods.

CORRESPONDENCE

CONCERNING CONSERVATION.

Exhibit I.

"The Quip Quarrelsome."

Sir,—In your issue of December 1st I note an editorial entitled "An Indictment of Conservation." Inspired by the animus that you have consistently shown, you quote with tacit approval the ridiculous statements made by Mr. Stevens—statements that anyone with even a superficial knowledge of mines and mining, knows to be absolutely false. For example, Mr. Stevens states—and receives the stamp of editorial approval—that "in a single county of Michigan there "is more iron ore than any 'professional conservation-"ist' has estimated to exist in the whole world." I have no conservation data for the whole world, but, in the report of the United States National Conservation Commission, I find the supplies of iron ore in the United States estimated at 4,785 million tons—say four and three-quarter billion tons! The International Geological Congress, 1910, estimated the available iron ore resources of the world at 22,408 million tons, say, and of the whole state—not a county—of Michigan at 285 million tons. Does Mr. Stevens? Does anybody with any regard for a reputation for accuracy and veracity, mean to say that a single county in Michigan contains four and three-quarter billion tons of iron ore, much less, twenty-two and a half billion?

So far as his statements concerning the Guggenheim investments are concerned, if they have in the Bonanza mine a "sort of copper-plated gold brick," it is due to their having been misled by their own engineers. It is a somewhat novel proposition that, because, according to the erratic Mr. Stevens, they have made a losing investment in copper, they should be allowed to recoup themselves by taking up large areas of coal lands in defiance of the law! He further says that they are compelled to import "inferior" coal from British Columbia. The best information that I have is that Vancouver Island coal is of as good a quality as the Alaska coal and that much of the so-called, high grade Alaska coal should be "mined with a spoon." The editor of the Canadian Mining Journal would be better employed if he endeavoured to get some reliable data to controvert aspersions upon one of our most important mineral resources instead of giving them a quasi confirmation. If Stevens et al would devote their attention to getting proper mining laws for Alaska instead of wild and untruthful denunciations of all and sundry, they would, at one and the same time, achieve something material and raise themselves in the estimation of all right thinking persons.

As for the statement that Alaskans are compelled to "pay double or triple" the price for fuel that they would pay if the Alaskan coal beds were developed, it is absolutely the reverse of correct, either in substance or in detail.

Respecting his assertion that the Washoe smelter may be shut down to save some trees in the federal forest reserves that are only fit for tepee poles, I have the word of the Chief Forester of the United States that the fumes have destroyed "forty million feet of merchantable timber," and that all that is needed is the installation of special appliances to eliminate poisonous fumes from the smoke.

When a man calls conservationists "political economists of the Stone Age and first cousins in mental capacity, to the Troglodytes"; when he raves that "the most odious forms of despotism" are being imposed upon miners in the Western States; that the conservation movement is a "cleverly devised scheme" to fix upon the necks of Americans "the "iron collars of serfdom"; that Americans are suffering from "an extensive system of paid spies, an organized claque," etc. ad nauseam, it is charitable to assume that he is intoxicated with his own verbosity, particularly when his statements are so grossly inaccurate. It would be flattery to say of him, that he has constructed a number of very large edifices upon a knife edge breadth of fact.

But what shall be said of the editor who gives these astounding statements a quasi endorsation. The statement, by inference, that "many blunders and not a few political sins are being committed in the name of conservation," either says too little or too much. Does the editor of the Canadian Mining Journal mean to say that "blunders" and "sins" are being committed in Canada in the "name of conservation?" If so what are they? If not, why not specify the United States as the country to which he refers? Or, is this cunningly worded ambiguous sentence part of the campaign against the Conservation Commission initiated nearly two years ago at the instigation of a geologist in Ottawa whose political activities are not unknown and his alter ego in Toronto, both of whom are at present nameless but may not continue nameless very much longer.

In your issue of May 15th, 1909, you stated that "lumbermen, farmers and miners" were not represented on the Conservation Commission. You continued, "Are lumbermen, farmers and miners not to be trusted? Are they uniformly robbers and plunderers? Or are they ignorant children who forsooth, must be led by the hand?"

When this precious balderdash was penned, there were on the Commission, the following representatives of the lumbering, the agricultural and the mining interests from each province, the Minister of that province charged with the administration of its forests, lands and mines, the Minister of Agriculture, the Minister of Mines and the Minister of the Interior for the Dominion; also five lumbermen, the late head of the famous Macdonald Agricultural College, a Deputy Minister of Agriculture, and the Dean of the only Forestry School in Canada, twenty in all! And the Canadian Mining

JOURNAL tells us that the lumberman, the farmer and the miner are not represented! It must have been a surprise to the Hon. Frank Cochrane, for instance, to be informed by your sapient self that although Minister of Lands, Forests and Mines for the premier province of the Dominion, he does not "represent" those interests. It is to be hoped that the advice you, at intervals, tender to the mining interests of Canada is based upon more accurate information than you seem to have had in this instance, assuming, as a matter of course, that you would not stoop to making wilfully false statements. Possibly your advice is so freely tendered upon the principle that the best man to settle a difference of opinion is the man who does not know anything about it because he is not biassed either way?

JAMES WHITE,
Secretary, The Commission of Conservation.
Ottawa, Dec 15, 1911.

Exhibit II.
"The Retott Courteous."

EDITOR CANADIAN MINING JOURNAL:—
Toronto.

Sir,—I have before me your issues of December 1st and December 15th, and note your editorial, "An Indictment of Conservation" in your issue of December 15th.

In your editorial on my address before the American Mining Congress, you quote. as a speeimen of my "denunciatory eloquence": "The entire Ameriean industry is threatened by men operating under the names of progress and reform, but who are political economists of the Stone Age, and first eousins, in mental capacity to the Troglodytes." You comment on this that I adopt brass knuckles, and that my language is extravagant and intemperate, and also state that my language is far from dispassionate, and state that while my attitude does not remotely resemble the judicial, yet I voice a growing belief that many blunders and not a few political sins are being committed in the name of conservation. From your own editorial on organized labour, fifteen days later, I extract the following excerpts: "This is but one instance of the desire of demagogues from the United States to control Canadian labour, to add to their own exchequer the revenues derivable from Canadian miners and other workmen. Canada has not been eursed with the hired assassin and the professional dynamitard. Why her workmen should eontribute to the support of these classes in the United States is not clear."

Regarding this latest quotation from your eolumns, I beg to observe that, "extravagant and intemperate as your invective may be, there is certainly a degree of right on your side. While your language is far from being dispassionate, and while it does not even remotely resemble the judicial, yet you voice a growing belief that many political sins are being committed in the name of—labour."

HORACE J. STEVENS.
Houghton, Mieh., Dec. 27, 1911.

BOOK REVIEW

Types of Ore Deposits—Edited by H. Foster Bain—with Chapters by. H. Foster Bain, E. R. Buckley, S. F. Emmons, W. H. Emmons, F. H. Hatch, J. F. Kemp, A. C. Lane, C. K. Leitch, T. A. Rickard, and others—378 pages. Illustrated—Price $2 postpaid. Published by the Mining and Scientific Press, 420 Market St., San Francisco, and the Mining Magazine, 819 Salisbury House, London, E.C., 1911.

This is the latest of the timely series of eompilations published by the Mining and Seientifie Press under the able editorship of Mr. T. A. Riekard and Mr. H. Foster Bain.

The material is not new. Some of the chapters were first published as artieles in the Mining and Scientifie Press; two were originally papers read before the Canadian Mining Institute; and the rest are taken, mainly, from the Transactions of the American Institute of Mining Engineers, and the reports of the United States and the State Geologieal Surveys. The general diseussion of the origins of oreshoots was first printed in Eeonomie Geology. This diseussion forms the eoncluding ehapter.

A summary of Mr. Bain's introduction shows the purpose and seope of the book. "The science of ore "deposits" says Mr. Bain, "has become so broad that "no one man can hope to eompass the field." With this indisputable fact in mind, the eompiler has selected a series of deseriptions of typical ore deposits, each description written by an engineer or geologist who is especially familiar with the given type. The plan of treatment followed is first, a plain statement of facts, then the author's interpretation of those facts.

The book is not complete; but, as far as it goes, it is representative. It presents the actual diversity of types of ore deposits, and, as well, the different interpretations of observed facts.

As illustrating this last clause there may be eited the early belief, a belief still not without supporters, that many bedded ore deposits were formed like sedimentary rocks. In reality, despite external appearances, many of these bodies have replaced pre-existing sedimentary beds. Mr. J. D. Irving deals fully with this phase in a chapter entitled "Replacement Orebodies and the Criteria by means of which they may be recognized." Other bedded deposits of undoubted sedimentary origin, are described by Mr. C. H. Smyth, Jr., who takes the Clinton type of iron-ore deposits as his text.

The principles laid down by Van Hise are applied, with only incidental qualifications, by Prof. C. K. Leith in the ehapter on the Lake Superior type of iron-ore deposits. Prof. Leith differs from Van Hise in emphasizing the relation of the ores to certain ellipsoidal basalts and suggests that derivation of the ores from them may have been not only through proeesses of weathering, but through direct contribution by juvenile waters. This is in keeping with the trend of opinion during the last deeade.

Mr. Bain himself is responsible for the third chapter whieh treats of the flats and pitches of the Wisconsin lead and zinc distriet. One object of the ehapter is to demonstrate the primary origin of these deposits—the absence of any direct relations to igneous roeks or agencies. The fact is alluded to that there is general agreement as to the main eonelusion—that the lead and zine ores of the upper Mississippi Valley were deposited by meteorie waters eireulating at shallow depths.

The lead and zinc deposits of the Ozark region, (Missouri—Arkansas) are described by Mr. E. R. Buckley. As to the origin of these commercially important and structurally varied deposits Mr. Buckley disagrees

with Van Hise and Bain, who held that artesian waters were the first concentrating agents. He maintains also that the ores were formed by meteoric waters circulating through only the water crust of the earth, and deriving their metallic contents by leaching both igneous and sedimentary rocks, but having no other relation to the latter.

Dr. A. C. Lane, in his chapter on Lake Superior native copper deposits, accentuates the genetic relationship of these deposits with certain igneous rocks.

In the chapter on the Cobalt district, originally read by the late S. F. Emmons before the Canadian Mining Institute, the Cobalt deposits are described as the roots of old veins greatly enriched by repeated secondary action. (Editor's Note:—With all due respect to Mr. Emmons' opinion, it may be stated that those who know Cobalt best do not support him). In other chapters Mr. O. H. Hershey takes up the Treadwell deposits, characterizing them as essentially primary; Mr. T. A. Rickard describes the saddle reefs of Bendigo, a special type of deep-seated veins; Dr. Kemp outlines the geology of contact deposits and the influence of magmatic waters; Mr. F. H. Hatch writes on the conglomerates of the Witwatersrand; Mr. J. D. Irving on replace orebodies; Mr. W. H. Emmons on outcrops of orebodies; and Mr. R. A. F. Penrose on certain causes of oreshoots.

Mr. Bain sums up, thus the light that is shed on the future study of ore deposits by this resume:—First, no single theory can explain all types of ore deposits; Second, discussions as to relative importance of different processes are not profitable. Personal opinions must obtain until quantitative methods of geological work make notable advance. Third, there is need of more refined methods of investigation. Hypotheses must be tested by experiment. Fourth, a large body of accurately determined facts is required, particularly in recording the development of mines. Fifth, there should be much less generalization from the study of single types or districts, and more careful comparative studies.

We can, without hesitation, recommend this volume to our readers. It is not a text-book, nor is it intended for such. But it is remarkably inspiring and informing. It represents the cream of late economic geological thought in the United States.

THE WORK OF THE GEOLOGICAL SURVEY DURING THE YEAR, 1911

(Specially written for the Canadian Mining Journal.)

In addition to the regular office routine, the field work of the Geological Survey for the year 1911 was vigorously prosecuted, and investigations were carried on in various parts of the country by all the divisions of the Department. The removal of the Department early in the year to its new quarters, in the Victoria Memorial Museum, and the consequent opportunity afforded for expansion in museum work also necessitated a great deal of cataloguing and re-arranging of the excellent collection of material which has been assembled by the Survey and which it was impossible to exhibit properly in the narrow quarters of the old Museum. A few notes on the work of the various members of the technical staff may be of public interest:—

Geological Division

Mr. J. A. Allan continued the study of a section across the Rocky Mountains, along the line of the Canadian Pacific Railway. He also made a reconnaissance in the Beaverfoot Range and studied the mineral deposits.

Mr. W. A. Bell made a palaeontological study of the Carboniferous rocks exposed along the shores of Chignecto Bay, with the object of determining the physical conditions of deposition of the Carboniferous sediments of the Cumberland and adjacent coal basins.

Dr. D. D. Cairnes studied the geology of an area sixty miles long and five miles wide, along the Yukon-Alaska Boundary, between the Yukon and Porcupine Rivers. He also made a preliminary examination of the quartz veins in the Klondike district.

Mr. Chas. Camsell examined the gravels of the Tulameen River, for the purpose ofo btaining further information regarding the occurrence of diamonds in that district. He also made a study of the geology of Steamboat Mountain, Siwash Creek and Fraser Canyon, besides making a reconnaissance into the country west of Lillooet.

Mr. Chas. Clapp carried on a detailed survey of the Nanaimo district, in which is situated the producing mines of the Nanaimo coal field. A visit was also made to the Cumberland-Comox and Suquash coal fields.

Mr. W. H. Collins continued a detailed examination of a rectangular area seventy-two miles by forty-eight miles, lying about fifty miles north of Sudbury. This includes the West Shining Tree District which has already been brought to the attention of the public by the discovery of gold in Keewatin schists.

Dr. R. A. Daly made a reconnaissance of the area covered by the Shuswap sheet, with a view to issuing a report on the same. The map of this part of British Columbia has already been published by the Geological Survey.

Mr. D. B. Dowling finished mapping the coal area immediately adjoining the Grand Trunk Pacific in the Rockies, and visited a number of localities in Alberta and Saskatchewan where new mines are being opened.

Mr. E. R. Faribault was engaged in an examination of the gold-bearing series in the southern part of Lunenberg and Queens counties. He also made a detailed examination and survey of the following gold districts: Blockhouse, Mill Village, Vogler's Cove, and Middlefield or Fifteen Mile Brook. Scheelite was discovered in a vein at Middlefield and visits were paid to the tungsten discoveries at Waverley and Baker's Settlement, to the tin and tungsten discovery near Mill Road in the vicinity of New Ross, and to the scheelite mines which are being operated near Moose River.

Prof. A. G. Foerste spent some time on Manitoulin Island studying the subdivisions of the Lorraine and Richmond formations.

Dr. J. W. Goldthwait spent some time during the summer in examining and tracing the raised beaches in the peninsula of Gaspe and in New Brunswick.

Mr. R. Harvie continued an examination of the serpentine belt of southern Quebec. In the district exam-

ined the serpentine is of less importance than farther north, but important copper ores are found associated with the diabase. The discovery of a new locality for fossils on Lake Memphremagog is of importance in permitting of a more accurate determination of the age of the formations of that section.

Mr. E. D. Ingall was engaged in a study of the geology of Ottawa and vicinity. Much of his time was also spent in the examination of borings and in keeping in touch with drilling operations throughout the country, for the purpose of getting information bearing on geological problems and of rendering assistance to the drillers in their operations.

Mr. W. A. Johnston completed the three topographical sheets covering the country in the vicinity of Lake Simcoe. These sheets are to be published on the scale of one mile to one inch. The work involved also a study of the superficial deposits and of the Ordovician formation.

Mr. R. A. A. Johnston worked on a mineral index, with a view to publishing an annotated list of the minerals of Canada. The examination of mineral samples sent in for identification also consumed much of his time.

Mr. Jos. Keele examined a great number of scattered deposits of clay and shale in various parts of Canada and made laboratory tests of samples taken and of samples sent in to the Survey to be reported upon.

Mr. L. M. Lambe was engaged in studying the many recent and valuable accessions to the museum and in preparing for the arrangement and proper public display of the collections of fossil vertebrates.

Dr. A. C. Lawson visited the section of the country along the Canadian Northern Railway from Fort Frances east to Steeprock Lake, and reviewed the geology in the light of knowledge obtained regarding Pre Cambrian geology during the last twenty-five years. This section of country had formerly been worked over by Dr. Lawson in 1885-1887.

Mr. W. W. Leach made a study of the geology of the Blairmore-Frank coal field and measured a number of sections, preparatory to the publication of a map of that field.

Mr. O. E. LeRoy examined the geology of one hundred square miles in the vicinity of Nelson, and under his direction Mr. J. Drysdale mapped an area of sixteen square miles embracing the Franklin camp.

Mr. G. S. Malloch made a traverse from Hazelton to Groundhog Coal Basin, and made a preliminary examination of the south end of this basin. He also examined the geology of the Kispiox Basin and visited a number of the more recently discovered metalliferous deposits near Hazelton.

Mr. R. G. McConnell completed his work in the Portland Canal district and made a study of the geology and mineral deposits on Observatory Inlet and Salmon River.

Mr. Wm. McInnes was engaged in work on the map of a portion of Saskatchewan and in work in connection with a study of the Coal Resources of the World for the International Geological Congress.

Mr. J. J. O'Neill made a petrographic study of Mt. Beloeil and Rougemont, to complete the study of the Monteregian Petrographic Province.

Dr. P. E. Raymond directed his attention to the subdivisions of the Ordovician formations in southern and eastern Ontario. The latter part of the season was spent on the rocks in the vicinity of Quebec and Point Levis and on rocks of the same age between Point Levis and Lake Champlain.

Mr. L. Reinecke did the geological work for the Beaverdell sheet and examined the more important prospects embraced within the sheet and in the country adjacent.

Dr. Heinrich Ries continued his examination of clay and shale deposits in the western provinces of Canada, and also visited Eastern Ontario and Quebec.

Mr. S. J. Schofield studied the geology and ore deposits to the south-west of Cranbrook and examined a group of deposits around Kimberley.

Mr. J. Stansfield examined typical mica, graphite and apatite deposits in the Townships of Buckingham and Hull and the Seigniory of La Petite Nation.

Dr. Clinton R. Stauffer continued his study of the Devonian system in the south western part of Ontario.

Dr. Marie C. Stopes made a palaeontological study of the Little River Series in the vicinity of St. John, New Brunswick.

Mr. F. B. Taylor continued a study of the Moraines and drift deposits of southwestern Ontario.

Dr. C. D. Walcott was engaged in the study of the Cambrian fauna of the Rocky Mountains in the vicinity of Field.

Mr. W. J. Wilson studied our collection of fossil plants, selecting specimens for exhibition in the museum, labelling and cataloguing.

Mr. M. E. Wilson made a geological examination of the country along the Height of Land, south east of Lake Abittibi, where some prospecting has been done and quartz veins are found in the Pre Cambrian rocks.

Dr. G. A. Young made a study of the geology of the area south of Moncton, with special reference to the occurrence of petroleum and natural gas in the Stony Creek field and the oil shales of that portion of the province. Under his direction Mr. H. E. Kramm investigated the mode of occurrence of the gypsum deposits at Hillsborough.

Topographical Division

There were several parties engaged in topographical work. Mr. W. H. Boyd, Chief Topographer, had a party working in the vicinity of Coleman, Blairmore, Frank, Bellevue and Hillcrest, preparatory to the publication of a topographical sheet on the scale of one mile to one inch. He also completed a detailed map of Turtle Mountain and the Frank Landslide.

Messrs. R. H. Chapman and K. G. Chipman mapped a portion of Vancouver Island, embracing Nanaimo, Alberni and Cowichan Lake; the former doing the work for the northern part of the sheet and the latter for the southern part.

Mr. W. E. Lawson made a topographical survey for a sheet on the scale of one mile to one inch, in the vicinity of Moncton, N.B., including the oil and gas district.

Mr. S. C. McLean did the triangulation for a topographical map of the Windermere district.

Mr. A. C. T. Sheppard completed the work on the topography of the Slocan district.

Natural History Division

Prof. John Macoun completed writing a flora of the Maritime Provinces and made collections in the vicinity of Ottawa, preparatory to writing an account of the flora of that district.

Mr. Jas. Macoun was engaged in naming and classifying botanical collections.

Mr. P. A. Travener was engaged in re-labelling the collections and arranging them preliminary to cataloguing.

Mr. C. H. Young spent the summer on the coast of

New Brunswick, collecting material for an East Coast Bird Group. This material has since been mounted.

Anthropological Division

Both museum and field work have been actively conducted by the staff of the recently established Anthropological Division. Dr. E. Sapir, the head of the Ethnology Section, spent some time in a reconnaissance of various Iroquois and Algonquin reserves in Ontario and Quebec.

Mr. C. M. Barbeau made research trips to Lorette, Province of Quebec, to Amherstburg, Ontario, and to Quapaw Agency, Oklahoma, for the purpose of studying the Huron-Wyandots.

Dr. A. A. Goldenweiser of Columbia University, New York, spent part of the summer in studying the social organization of the Iroquois of Grant River Reserve.

Dr. Cyrus McMillan of McGill University spent five months in research in order to obtain folk-lore material among the Micmacs of Nova Scotia and Prince Edward Island.

Mr. Wm. H. Mechling carried on ethnological and linguistic research among the Micmac and Malecite Indians of New Brunswick.

Mr. V. Stefansson continued his researches among the Eskimos of the Arctic region between Mackenzie River and Hudson Bay.

Dr. Harlan I. Smith of the Archaeology section spent some time classifying museum material, and visited village sites in the vicinity of Victoria Road, Ontario, and Washington, Ontario.

Mr. Wintemburg was employed to make an archaeological survey of Blandford Township, Oxford County, Ont.

WORK OF THE MINES BRANCH OF THE DEPARTMENT OF MINES, OTTAWA, 1911

(Written specially for the Canadian Mining Journal.)

An official summary of the work of the Mines Branch will, of course, be published in the annual Summary Report of the Director. In the meantime the following brief resume of the work done during the past year may be of immediate interest.

A large part of the work undertaken by members of the staff during the year is, as might be expected, a continuation of investigations begun during the previous, or in former years. Of the new work initiated during the year, may be specially mentioned the preparation of a monograph on the Sudbury nickel-copper deposits of Ontario; the investigation of salt and gypsum industries of Central and Western Canada; an investigation of feldspar and phosphate deposits; and a special inquiry into the Canadian market for certain metallic and non-metallic minerals and mineral products; of which, considerable quantities are believed to be imported by manufacturers, but which might easily be supplied from Canadian sources.

The laboratory installed during 1910 for the experimental concentration of low grade magnetic iron ores was operated under the direction of Mr. George Mackenzie, assisted by Mr. F. Ransom.

An extended examination was made of the titaniferous iron-bearing sands found at the mouth of the Natashquan River on the north shore of the Gulf of St. Lawrence; and concentration tests were made upon large samples from these deposits. Tests were also made upon ores from Wilbur, Robertsville, Culham, and the Goulais River in Ontario, from Bathurst, N.B., and from Torbrook, N.S.

The systematic investigation of the iron ore deposits of Canada carried on during the last six years by the Mines Branch was continued during 1911 by E. Lindeman, assisted by W. M. Morrison, O. Gallaher, and N. D. Bothwell. Examination was made of the iron bearing deposits along the Central Ontario Railway, and at Calabogie on the Kingston and Pembroke Railway.

The investigation consisted in the study of the geological features of the various iron ore deposits; in taking representative samples of the ores; and in making topographical and magnetometric surveys of the various iron ore fields. The results of the investigation will be published in bulletin form at an early date.

The nickel-copper deposits and the smelting industry at Copper Cliff and Victoria Mines have been the subject of special study during the year by Professor A. P. Coleman of Toronto University, who will prepare a monograph on this industry, giving the latest information with respect to the Sudbury district, with a description of the mines, and of the mining and metallurgical processes in use.

During the early part of the year Dr. A. W. G. Wilson was engaged in collecting material for a report on pyrites and its uses. It is expected that this report will be ready for publication early this year. The investigation into the known copper resources of Canada, begun two years ago, was also continued this season. During the summer all the operating copper mines and smelters in British Columbia were visited, and a report embodying the results of these investigations will be prepared during the present winter.

Under the direction of Mr. B. F. Haanel a series of tests were made with the peat manufactured at the Victoria Road peat bog and at the Government peat plant at Alfred, to show the suitability of this fuel for the production of power when burned in a peat producer gas power plant.

Towards the end of 1910 Mr. Edgar Stansfield, M.Sc., formerly engaged as engineering chemist on the fuel investigations conducted at McGill University—was permanently appointed as engineering chemist to the Division of Fuels and Fuel Testing. In August, 1911, Mr. John Blizard, B.Sc., who was for five years lecturer in Mechanical Engineering at McGill University, and who, during that time was actively engaged in the work of investigating and testing the coals of Canada then being carried on in the laboratories of that institution, was permanently appointed technical engineer to the Division.

Since the addition of the above mentioned officers to the Mines Branch staff, a series of tests with the peat producer gas power plant, as altered by the manufacturers, the Korting Brothers of Hanover, Germany, have been carried on, and a full report is now in course of preparation.

In addition to the peat gas producer, a 125 H.P., Westinghouse, double zone, bituminous coal, gas producer has been installed; which is capable of generating

a gas free from tar—without the employment of mechanical tar extractor, etc. With this producer it is proposed to carry on a series of tests on a commercial scale, of Canadian and imported bituminous coals; to show the economies which can be effected by the burning of coal in such a power plant as compared with our ordinary steam power plant.

Mr. A. Anrep, Jr., who, last year, devoted a part of the time to the manufacturing of peat at Alfred, and towards the end of the season surveyed and examined the Holland peat bog, Ont., devoted the entire summer of 1911 to the examination and delimitation of the peat bogs of Manitoba; with a view to ascertaining their value for the manufacture of peat fuel, moss litter, and other purposes. This report is now being prepared for the press.

The Government peat plant at Alfred was operated again this summer, for a period of 93 days, during which time about 2,000 tons of peat fuel were manufactured.

About 700 tons of this air-dried peat fuel were sold to private parties in Ottawa, Montreal, and elsewhere, for domestic and other purposes; while over 100 tons were shipped to the Fuel Testing Station at Ottawa, where it will be utilized in the peat producer gas power plant for the generation of power to drive the machinery of the ore concentrating laboratory and for other experimental purposes.

Mr. L. Heber Cole was engaged in an investigation of the gypsum and salt industries of Central and Western Canada. During the early part of the summer, the gypsum deposits situated along the Grand River between Cayuga and Paris in the province of Ontario, and the salt area in the district from Windsor to Kincardine in the counties of Essex, Lambton, Huron, and Bruce, were visited.

The gypsum area in Manitoba north of lake St. Martin was then examined and subsequently several gypsum deposits in British Columbia.

The Manitoba deposits have been operated for some years; calcining mills being located in Winnipeg. The British Columbia deposits have not yet been commercially operated; but a beginning is now being made in their exploitation.

Several plaster plants in the State of Michigan were visited, with a view to gaining information respecting their methods of operation.

Mr. Hugh de Schmid was engaged during a part of the summer, in obtaining further information on the occurrence and use of mica; for incorporation in the new monograph upon this mineral, now in the press. The remainder of the season was devoted to an examination of certain of the phosphate and feldspar mines in the Provinces of Ontario and Quebec. It is intended to complete the field work in connection with the deposits of these minerals during the ensuing summer, and monographs upon both these minerals will be subsequently prepared.

Mr. Frechette was engaged in collecting data from manufacturers in Ontario and Quebec concerning the minerals and mineral products used by them, with special regard to the quantity, quality, and source of their present supply. The ultimate object of the investigation is to encourage the use of Canadian minerals, by pointing out to the producers the requirements of the market, and the form in which the minerals should be prepared for the various industries in which they are employed.

During the "field work" Mr. H. Bradley acted as assistant.

Sixty-three towns were visited in Ontario, and twenty-six in Quebec.

A report on the Building and Ornamental Stones of Ontario has been prepared by Dr. W. A Parks of Toronto University, as the result of his special work during the summer of 1910. This investigation is being continued, to cover the whole of Canada. During 1911, not only did Dr. Parks visit Ontario, but also the principal quarries in Quebec and the Maritime Provinces.

In addition to field investigations, laboratory tests on the physical characteristics of the various stones are being carried out under the direction of Dr. Parks at Toronto University.

The subject of explosives—the handling, storage and use of which were investigated during 1910, and reported upon by Captain A. H. P. Desborough—was followed up in 1911 by the preparation (in collaboration with the Department of Justice) of a Bill entitled "An Act to regulate the manufacture, testing, storage and importation of Explosives." The Bill was introduced by the Minister of Mines during the last session, but did not reach the final stages in Committee, before the dissolution of Parliament.

Mr. J. G. S. Hudson investigated and reported upon three disasters in explosive factories, which occurred, respectively, at Sand Point, Ontario, April 27, 1911: Beloeil, Quebec, Sept. 23, 1911; and Rigaud, Quebec, Oct. 19, 1911. A fourth explosion took place in the factory at Departure Bay, British Columbia, on the 22nd of December. Mr. Hudson states that 15 lives were lost in these several explosions.

The National Mine Safety demonstration held at Pittsburg, Pa., U.S.A., Oct. 30 and 31—under the auspices of the United States Bureau of Mines—was attended by Mr. Hudson, as representing the Mines Branch.

The annual collection of statistics of mineral and metallurgical production in Canada was undertaken, as usual, under the direction of Mr. John McLeish, and a preliminary report on the mineral production of Canada during 1910 was issued on March 1, 1911. The complete and revised report was then prepared; special bulletins on the production of Iron and Steel; Coal and Coke; and on Cement, Lime, Clays, Stone, and other structural materials, together with a General Summary of the Mineral Production of Canada, being issued as advance chapters of the full report.

Mr. C. T. Cartwright spent the latter part of the year visiting metalliferous mines in British Columbia; collecting information and data for a revised edition of the general report on the Mining and Metallurgical Industries of Canada. The Statistical Division is now engaged collecting statistics of mineral production during the calendar year 1911; and the active and prompt co-operation of all mining operators, brick makers, quarry owners, etc., is urgently requested.

The year 1910 was one of maximum output in the mining industry. During 1911, however, several factors—including particularly the closing down of the chief collieries in Alberta during a large part of the year, accompanied by the cessation of smelting operations at Grand Forks, B.C., will result in a lower production of coal, and of copper than might otherwise have been expected. The silver output of Cobalt, and the gold output of the Yukon have, on the other hand, continued to show satisfactory growth. The development—to the producing stage—of the Porcupine district, from which much was expected, has been delayed

by the disastrous summer fires that destroyed so many lives, and so much mine equipment in that district. The continued activity in building operations throughout the chief centres of population of the country would seem to indicate a successful year in the production of the various structural materials; including cement, lime, clays, stone, etc.

The usual routine work has been carried on in the Chemical Division under Mr. F. G. Wait and his assistants, Messrs. M. F. Connor and H. A. Leverin.

THE COAL TRADE OF NOVA SCOTIA DURING 1911 A RESUME

(Written for the Canadian Mining Journal by F. W. Gray.)

The year 1911 was one of the most prosperous in the annals of the coal trade of Nova Scotia, and outputs have returned to the point where they were interrupted in 1908 by the trade depression and the coming of the United Mine Workers of America.

The outstanding incidents of the year were the acquisition of the properties of the Cumberland Coal & Railway Company by the Dominion Steel Corporation, the collapse of the strike at the Springhill Mines, and the flooding of the Port Hood Colliery.

With the exception of the explosion in the No. 3 Colliery of the Nova Scotia Steel & Coal Company in January last, no accident occurred involving serious loss of life. The fatality rate at the mines was slightly higher than in previous years. Exact figures on this point are not yet obtainable, but the fatality rate will be about 2.6 per thousand men employed.

So far as can be estimated from the approximate figures available the coal output of Nova Scotia during 1911 will be near 6,300,000 tons. Of this tonnage 82 per cent. is from Cape Breton mines. The combined production of the mines controlled by the Dominion Coal Company and the Nova Scotia Steel & Coal Co. totals 80 per cent. of the output of the Province. The Dominion Coal Company themselves produced 68 per cent. of the provincial output.

The royalty payments to the Government of Nova Scotia for tonnage extracted in 1911 will approximate $700,000, a very satisfactory revenue from one industry. Great honour should be given in these days of realization to those statesmen who fought for and reserved to the people the potential revenues of Nova Scotia's mineral resources. Had a similar procedure been followed when the common lands of the United Kingdom were enclosed and granted to manorial lords, many of the financial difficulties which are to-day troubling the parliamentarians of Britain might have been mitigated.

The output of the Glace Bay mines of the Dominion Coal Company will be within a few thousand tons of four million tons, an advance of 440,000 tons on the output of 1908, the best previous year. The 1910 output was 3,526,754 tons. The new collieries in the Lingan district produced over 500,000 tons, or 13 per cent. of the company's output. In 1912 these mines should produce between 700,000 and 800,000 tons. Operations in the Lingan field were commenced in 1907 in a practically virgin area, and to have attained the present rate of output in a little less than five years is a creditable performance.

At the end of the year the Coal Company had ten collieries in full production in the Glace Bay field, two collieries in full production and two in process of development in the Lingan field; two collieries in the developing stage in the Morien field on the areas formerly

No. 4 Bankhead.

owned by the Cumberland Coal & Railway Company; or sixteen collieries all told. In 1912 it is probable that at least one other colliery will be commenced in the Lingan district. Next year a further increase in the Coal Company's production is contemplated, and an output of four and one-quarter million tons is a probability under normal circumstances.

The Coal Company has under way a large programme of extension. At Sydney a new shipping pier is under construction and will be completed during the summer of 1912. This pier is designed to accommodate the largest type of freighting steamer, and will be modern in every respect.

A Baum coal washer is also in course of erection near the new shipping pier. The work is more than half completed, and it is expected to have the plant in operation about May. It will have a capacity of 120 tons of washed product per hour. This is the first Baum washer in America. The plant is an expensive one in first cost, but has given remarkable efficiency in Europe. The main feature in which the Baum system differs from other jig washers is that the impulse to the washing water in the boxes is given by compressed air, instead of through the usual method of eccentrics and plungers. It is claimed that the Baum method gives more buoyancy, and that the product is washed with a minimum of waste. The plant is economical in the use of water and in the labour required to operate. The guarantees given by the makers ensure a well-washed uniform product, that should find a ready market. The design will allow for a second unit of similar capacity. The machinery will be electrically operated.

Practically all the new power equipment put in during the year was electrical. What really amounts to a comprehensive scheme of electrification has been carried out by the Dominion Coal Company during the past five or six years. The bulk of the pumping, ventilating and screening machinery in the Glace Bay field is now done by electric power transmitted from the No. 2 Power Station. On the Lingan side, the air compressors at No. 12 and 14 Collieries, the bankhead and screening machinery at No. 14, and all the ventilating machinery of Nos. 12, 14, 15 and 16 collieries are electrically driven. An electric hoisting engine for No. 14 colliery will be delivered next spring, and it is probable that the hoists for Nos. 15 and 16 collieries will also be electrically operated. The generators in the No. 2 Power House will not be sufficient for the expected load from the Lingan mines, and a contract has been let for the equipment of an additional power station to be situated near Waterford Lake. The projected installation will consist of a turbo-generator set, using live steam, with a nominal rating of 2,500 KW. The boilers will be of the Bettington type, the first installation in America. These boilers are fired by dust, injected by a blowing fan, and are claimed to be the most efficient steam-raisers yet put on the market. The steam will be delivered at 175 lbs. pressure with 150 degrees of superheat. All the calorific value of the coal is said to be obtained, and good results can be obtained with poor quality coals. The residue of combustion is an irreducible slag. The new station will be in electrical connection with No. 2 station and power will be drawn by the Lingan or Glace Bay divisions as requirements may be. The new collieries at Birch Grove will also be electrically operated, and the transmission line is already erected.

Electrically driven Air Compressors. Capacity 3,000 cu. ft. per minute.

The exhaust-steam turbine in the No. 2 Power House has run very satisfactorily throughout the year.

The Nova Scotia Steel & Coal Company's output was 780,000 tons, about 60,000 tons less than the 1910 production. The decrease was caused by the explosion at No. 3 Mine, previously mentioned. No output was obtained from this mine for a few months after the explosion, and some time elapsed before conditions were as favourable as before the explosion.

No important new plant was installed, with the exception of some improvements to the present plant in

the shape of more modern and effective steam raising appliances. The company has in contemplation the installation of a 750 K.W. turbo-generator set, with mixed-pressure turbine.

The management expect to considerably increase their coal output during the coming year.

The output of the Springhill Collieries for the year will be 270,000 tons. The twelve months has been taken up with the recovery of the mines from the condition they perforce fell into during the U. M. W. strike. The output increased and at the close of the year was running about 36,000 tons per month, or the same as before the strike. For 1912 the production should exceed 400,000 tons. A small air-compressor is being erected, and it is probable that some coal-cutting machinery will be introduced.

The territory outside the present slopes is being tested by a diamond drill, and if a suitable location can be proved it is the intention to open up an additional slope. It is also proposed to erect a shipping pier at Wallace, on the Northumberland Straits, and a railway branch is projected from a point near Oxford Station on the Intercolonial Railway to the pier at Wallace.

The output of the Inverness Coal & Railway Company will be near 280,000 tons, or about the same as last year. This company's sales have to some extent benefited by the stoppage of Port Hood Colliery. With both Port Hood & Mabou Collieries under water, the mines of the Inverness Coal & Railway Company are the only ones of any importance in Inverness County. A company incorporated in London, Eng., as the Margaree Coal & Railway Co., controls large coal areas known as the Ste. Rose property, and from time to time rumour has been busy with the proposed operations of this company, but up to the present time no development work has been undertaken.

The Acadia Coal Co. increased its output considerably, raising about 370,000 tons. The influence of the new capital from Belgium is now being felt, and quite extensive improvements are under way at the present time. This company has likewise undertaken an electrification at the Allan Shafts equipped with a turbo-generator set rated at 2,000 KW., using live steam, similar to those being installed in the Glace Bay field. At the Albion Mines a steel bankhead is being built to serve two seams. An air-compressor is being installed, it being the intention to use coal-cutting machinery. A wash-house for the use of the miners, designed on the Belgian plan, is being erected. Shower baths are provided. Pit-clothes and ordinary wearing apparel are alternately hoisted to the roof of the wash-house by a rope and pulley, as is the usual custom at European mines. A temporary hospital and ambulance house are also being provided.

As a result of these large expenditures a large increase in outputs is naturally looked for.

The output of the Intercolonial Coal Co., remains about the same as in 1910, namely 250,000 tons.

The North Atlantic Collieries did very little during the year, only raising some 23,000 tons. The Eastern Trust Company, as Trustee for the bondholders, foreclosed on the property, which, after successive postponements was sold by the Sheriff at auction in December, realising $70,000 only. The identity of the purchaser has not been made public.

Compressor House, No. 14 Colliery.

Reviewing the work of the collieries generally, nothing in the year has been more striking than the improvement in the colliery power equipment. The substitution of electricity for steam has been general. Large economies are being affected by central generating stations using a combination of reciprocating and exhaust-steam turbine engines, or straight live-steam turbines. The power is transmitted long distances, and where there are a number of detached plants considerable economy is possible in the operation of pumping and screening machinery, where the power required varies and is affected by holidays and idle days. Apart from its economy, the use of electricity around the collieries eliminates the smoke and steam and much of the noise which is often so much in evidence, making the collieries and their surrounding villages much pleasanter places for all concerned, A properly

designed central power-station can effect great economy in fuel consumption, and in the utilization of inferior slacks and splint, which would otherwise cost money to place on the spoil bank.

The same improvement that has taken place in the colliery equipment and output has been noticeable in the arrangements for transportation. Freighting steamers of from 8,000 to 10,000 tons cargo capacity are no longer a novelty in the St. Lawrence coal trade. No additions of any importance were made by the Nova Scotia companies to their discharging plants in the St. Lawrence or in the ports of the Mariume Provinces. Considerable expenditure was made by United States coal companies in this respect in the competitive territory around Montreal, and the head-waters of the St. Lawrence, but this feature lies outside the scope of the present article.

The flooding of the Port Hood Colliery has been fully referred to in the columns of the Journal during the year. It is now the general opinion of those who have investigated the occurrence that the in-rush of water was not caused by any direct overhead fracture of the strata underlying the sea-floor. As a matter of fact, the sea-floor immediately over the point where the water came in is bare at low-tide, and it may also be stated that the hour when the water was first noticed would be about the time of low-tide. The evidence appears to point to the existence of an old river bed, which has been filled in with porous material, probably gravel overlain by sand. The present land surface overlying this concealed river-bed is above high-water mark, but the ancient channel may be near or at sea-level. Water may have followed down between the layers of the strata and have been held in the sandstone beds which are found above the coal. The inrush followed upon the drawing of pillars in the bottom level of the mine. It is not unusual in extracting pillars to have an inrush of water from overlying water-bearing strata, particularly if, as in the case of Port Hood, the break occurs at the lowest part of the workings. The rate of inflow at Port Hood was not greater than has been previously experienced in Nova Scotian coal mines, and the serious result of the inflow was caused by the totally inadequate pumping capacity and the lack of lodgement room. The pillar drawing which initiated the flooding was being carried on at a point distant only some 500 feet from the main haulage way. At the foot of the main haulage way the heading was driven down past the last level some 50 feet only, and this constituted all the available lodgement room.

On reviewing the circumstances of the flooding of Port Hood, therefore, the unfortunate occurrence does not present so serious an aspect as it did at first, so far as the physical side of the matter is concerned. The drawing of pillars at the near end of the level instead of at the far end was a reversal of the usual practice, and, as events have proved, it was a risky procedure to draw pillars in a 6-ft. coal seam, lying at a fairly high angle, in submarine territory, with no provision of lodgement room and inadequate pumping capacity. The truth of the matter is that submarine coal-mining is an expensive business and needs large capital outlay, and the use of methods of extraction which are slow in yielding profitable coal, necessitating as they do large expenditure on development work before any great quantity of coal can be taken out. The Port Hood Company had for some time been operating under financial difficulties, and they could not afford to provide the expensive pumping plant, the necessary expenditure on lodgement room and other things which with large capital they might have done. The property is a good one and has possibilities. With proper appliances the mine could doubtless be unwatered, but in any case the mine will always be an expensive one to operate.

Regarding the provisions made for safety of the mines, although nothing of an outstanding nature has occurred during the year, the tendency of everyone concerned with the coal industry is to increased precautions. The Commissioner of Mines sent a representative around the collieries during the summer to make tests of the quality and humidity of the mine air, and to ascertain the amount of coal dust in suspension. It is understood that further tests will be made during the winter, so that a comparison may be instituted between the relative humidity of the mine air in the summer as compared with the winter. Several of the coal companies have equipped their mines with hygrometers, and are following this matter up.

Legislation was proposed in the spring forbidding the use of any naked lights in the mines of the province, but the regulation has not as yet become law.

The Nova Scotia Steel & Coal Company purchased additional Draeger helmets and accessories shortly after the No. 3 explosion. The Dominion Coal Company did not make any additions to its equipment, with the exception of an electrically operated refill pump for charging oxygen cylinders. The new Rescue Station which is intended to serve the Lingan collieries is completed. The equipment will be purchased early in 1912. It is probable that the Coal Company will also equip their Springhill Collieries with breathing apparatus and fire-fighting appliances. The Acadia Coal Company is erecting a Station with smoke gallery and observation chamber, and is equipping it with breathing apparatus.

A central Joint Rescue Station for the Mainland collieries was mooted two or three years ago, and it was thought the Provincial Government would assist the operators in providing such a station, but apparently such a scheme has fallen through. The bigger companies will doubtless see the wisdom of providing for themselves, but the smaller companies will not be able to afford suitable provision. Nova Scotia led the way, and had the first properly equipped Rescue Station and trained rescue corps in America, but to-day she lags behind. British Columbia and Alberta have outstripped us, and in the United States most enthusiastic interest is being taken in everything that pertains to mine rescue work and first aid instruction. The time has passed when breathing apparatus was an experiment and under suspicion of being a fad. Hardly a month passes but it is used to fight fires and the results of mine explosions, and it is to-day as much an accepted part of the fireman's equipment as the hose and nozzle. Considering the income from coal royalties the Government could very well afford to aid in this work, particularly as in so doing they would be safeguarding their most valuable source of revenue.

The Dominion Coal Company Employees Benefit Society had its first full year of operation and is working out in a manner that promises well for the future. The membership has increased from 6,000 to over 10,000, and includes practically every employee in Cape Breton and at Springhill. The Society has dependent on it 54 widows and 238 children. The amount disbursed in sick and accident relief was $56,500. The sum of $18,000 was paid in relief to widows and children, and $23,000 was laid aside to cover the future benefits which will accrue to widows and children who came on the fund during the year. The gross income was $120,000, of which $52,000 was contributed by the workmen, $52,000 by the company and $11,000 by the Government. The

expenses of management amounted to $4,000. It will be seen that the expenses of managing are small compared with the income, and, under the consolidation of the funds, the Society's interest on its investments is sufficient to cover the working expenses. The Society is managed conjointly by representatives of the workmen and the company, but its real management is conducted by the workmen themselves, and it is due to the community of interests and the care exercised by the members themselves in passing claims that the Society is prospering. The total gross assets at the end of the year amounted to $134,000, of which sum $75,000 is laid aside as a Reserve Fund to insure stipulated relief payments to dependents, and $25,000 is placed to the credit of the Old Age and Disability Fund. The proportion of sickness claims to those arising out of disability caused by accident have been about the same under the new Society as was the experience under the old societies, namely that the accident claims were only half the number of those arising from sickness.

The year saw the close of the last of the abortive strikes which were called by the United Mine Workers of America, and it is to be hoped that this dark chapter of trouble is finished. During the first part of the year the strike at Springhill dragged along very wearily. The announcement that the Dominion Steel Corporation had obtained control of the Cumberland Coal & Railway Company was made towards the close of 1910, and early in the year the Springhill Collieries were attached to the properties operated by the Dominion Coal Company. The new management took immediate steps to police the mines and to afford protection to the workers. Up to this time the strikers' pickets had virtual control of the town, but the evident determination of the company to work its mines, despite imtimidation, exposed the inability of the local authorities to keep the peace, and a situation arose which necessitated the intervention of the Provincial Government. On the 3rd of April the town of Springhill was placed under the control of a Police Commissioner, who had a force of 30 constables under him, and a quick end was put to the forcible intimidation which the U.M.W. had so long carried on. It had long been apparent that the majority of the strikers were tence of their organization in Nova Scotia. In April they requested the coal-owners of the Province to meet them in joint conference to discuss a wage schedule governing all the coal mines of Nova Scotia. The coal- tired of the useless struggle, and wished to return to work, but were deterred from doing so by the fear of physical violence. As soon as this fear was removed by the presence of the Commissioner and his force, the strike collapsed, and the men sought terms through the intervention of the Government. After having been on strike for 22 months, the strikers returned to work on practically the same terms that had been open to them from the commencement of the trouble.

The Provincial Workmen's Association renewed its Agreement with the Dominion Coal Company for a further period of two years, carrying the present understanding to the end of 1913. The local leaders of the U.M.W. have attempted to hold meetings to condemn the action of the P.W.A., but without much success, as the native organization has gained in strength by the abortive strikes of the U.M.W., and in renewing this Agreement the officers of the P.W.A. had the approval of the great bulk of the company's workmen.

Miners' Houses at No. 14.

The U.M.W. officers have throughout the year attempted to impress the public with the continued exis- owners did not respond. When it is stated that not a single local of the U.M.W. of America in Nova Scotia was at the end of the year in sufficiently good standing to vote on the election of the International officers, the pretence of their leaders to speak for the workmen of the province needs no further exposure.

The natural dislike of all thoughtful Canadian trade-unionists to control from the United States has been crystallized by the revelation of the McNamara dynamitings, and the feeling that the American Federation of Labour has not cleared itself of complicity in these organized evil developments of militant unionism. It is still remembered that the coming of the U.M.W.A. to Nova Scotia was followed by riots, dynamiting and murder, accompanied by cynical and unblushing "graft", and a general lowering of morals. The organizers of the U.M.W. preach openly the doctrines advocated by Haywood of Colorada, namely, the "total abolition of the wage system" and the coming of the "social revolution", which they would help along by so-called "active" means, to use the hypocritical jargon of their propaganda, or, in other words, by civil war. It is small won-

der that the cautious Nova Scotian sees in these agitators a menace to the legitimate aims of labour, and prefers his own methods, which, though neither so sensational nor so "slick", are infinitely more likely to accomplish the wished-for end. The recent resolution of the A.F. of L. in Atlanta, Georgia, condemning the P.W.A. in vituperative terms, will not tend to mollify the indigation of the Nova Scotian unionist.

Although the present summary deals particularly with the coal industry, yet this is so connected with the steel industry, that some reference to the last-named is almost necessary.

The Dominion Iron & Steel Company has put into operation during the year 120 new bye-product coke ovens, and has now in operation an exceedingly fine coking plant, to describe which would require a separate article. The ovens are an improved Otto-Hoffman type, with higher and longer and slightly narrower coking chamber than the other ovens of the Steel Company. They give a yield of coke approximating 67 per cent. The bye-product plant has so far given excellent results. Everything in the new installation is of the most modern construction, and very substantially built. The ovens are charged, levelled and drawn by electrically operated machinery. The huge quenching machines lift off the oven door, receive the coke as it is pushed out by the ram, quench and break it up, and deliver it into cars.

The Steel Company has now four blast furnaces in operation, and expect to blow in the new furnace, No. 5, about February. A sixth furnace is under construction, so that the coal requirements are steadily increasing.

A corresponding increase is needed in the ore and limestone deliveries. The output of the Steel Company's Wabana mines in 1911 was roughly 564,000 tons, about 4,000 tons larger than the 1910 output. It is expected to get 750,000 tons of ore from Wabana in 1912.

The linestone quarries at Marble Mountain, Cape Breton, produced 435,000 tons, breaking all previous records by 60,000 tons. In addition to the Marble Mtn. quarries the Steel Co last spring opened a quarry at Ball's Creek, near Sydney, from which they obtain suitable limestone for the open hearth furnaces. This quarry will probably produce 40,000 tons in 1912. The dolomite quarries at George's River will produce about 20,000 tons. In order to meet the increased demand consequent upon the starting of the new furnaces, the Steel Company is opening up a limestone deposit on the shores of Port au Port Bay on the West Coast of Newfoundland. The work is now proceeding and before long the new quarries will be large producers.

A reference to the allied industries may not be out of place. The Dominion Tar & Chemical Company takes the tar and pitch from the Steel Company's ovens, and mages a remarkable variety of tar products, for which they have no difficulty in finding a market. During the year the Chemical Company added a creosoting plant, in which the piles for the Coal Company's new shipping pier and for the general construction work of the allied companies have been treated.

The Sydney Cement Company, whose product is manufactured from the Steel Company's slag, has kept up a steady production of both cement and pressed cement bricks. The Steel Company's new offices, the various new power-houses of the Steel & Coal Companies, and a large Academy in Sydney have been constructed of these bricks, and both cement and bricks have found a large local consumption.

During the year a large plant has been constructed in Sydney by Alex. Cross & Sons of Scotland for the making of slag fertilizer out of the Bessemer slag of the Steel Company. The fertilizer is simply finely ground slag without any admixture. The market for this latest bye-product will have to be largely created, but once the merits of the fertilizer are understood, the agricultural industry of the province should provide a ready outlet.

With the large additions to the Steel Company's plant such as the nail-mill, etc., this summary will not attempt to deal, as they will doubtless be fully reported elsewhere, and reference has been made merely to matters which directly touch the coal industry. Suffice it to say that the Steel Company's plant and operations are being practically doubled. The Nova Scotia Steel & Coal Co. is installing a fluid compression plant for ingots, at the Sydney Mines Works, and a hydraulic forging plant at New Glasgow.

THE NATURAL HISTORY OF HARTZ-FOREST*

(Written for the Canadian Mining Journal by J. C. Murray.

I have before me a small volume, printed in 1730, in the reign of His Majesty King George the Second. The title-page is exhaustive, in accordance with the pleasant habit of the time. The book is a translation from the German of H. Behrens, M.D., and the translator is John Andree.

Andree's dedication to the Prince of Wales is rich in humility

To
HIS ROYAL HIGHNESS
FREDERICK
PRINCE OF WALES
These Sheets
Are Dedicated with all
Possible Submission
By
(May it please YOUR ROYAL HIGHNESS)
YOUR ROYAL HIGHNESS'S
Most Obedient
Most Devoted, and
Most Humble Servant,
JOHN ANDREE.

It would be difficult indeed to compress within the limits of one page a more complete declaration of humble devotion.

To the reader Mr. Andree explains in a prefatory note his purpose in publishing the translation. The note opens thus:—

"That Branch of Learning call'd Natural History "has this advantage, that it suits the Genius of Men "in a more peculiar manner than any other Science "whatever: For whilst we inform ourselves of the "State of Nature in any part of the Globe, we are at "the same time agreeably entertained by the Variety "of Objects, and our Spirits are insensibly elevated by "adoring the Power of that Being which produced "those wondrous Works. But it will be needless to "say much in its Commendation, when we consider "that the several Societies of Learned Men, which

*My thanks are due to Dr. W. L. Goodwin, Director of the School of Mining, Kingston, Ont., through whose courtesy I have obtained temporary possession of the book on which this article is based.

"have been establish'd in sundry Parts of Europe, "have thought it worthy their particular Application "to impress this part of Knowledge, and cultivated it "with uninterrupted Assiduity, and that in order to "collect a True and Compleat Natural History they "encourage all Performances of this kind.

THE
Natural Hiſtory
OF
Hartz-Foreſt,
In His Majeſty King GEORGE's
German Dominions.
Being a ſuccinct
ACCOUNT
OF

The Caverns, Lakes, Springs, Rivers, Mountains, Rocks, Quarries, Foſſiles, Caſtles, Gardens, the famous Pagan Idol *Puſtrich* or *Spit-fire*, Dwarf-holes, Pits, moving Iſlands, Whirlpools, Mines, ſeveral Engines belonging to them; Ores, the manner of refining them; Smelting-houſes; ſeveral ſorts of Ovens, Hammer-mills, Vitriol and Glaſs-houſes, *&c.* in the ſaid Foreſt: With ſeveral uſeful aud entertaining Phyſical Obſervations.

Written in *German*
By H. BEHRENS, M. D

LONDON,
Printed by *W. Pearſon*, for T. OSBORNE in *Grays-Inn, Holbourn*. 1730.

"Upon theſe conſiderations I doubt not but the "Reader will conceive a favourable Opinion of the "preſent Undertaking, it being the only ſet Treatiſe "that has been wrote upon the Curioſities of this "Country; where Nature ſeems to have done her Ut-"moſt, to make Amends, as it were, for the disadvan-"tage of its Infertility."

You will be reminded by the title-page that the Hartz-Forest was part of the dominions of the august King George.

That the reader may not hold up his hands in horror at some of the tall stories told by Herr Behrens, the translator instructs him thuswise:—"But if the Reader "should find fault with some Accounts, which savour "too much of Superstition, I must desire him to observe "that they are inserted here to set forth the Genius of "the Inhabitants of the Country, and not as the Au-"thor's own Sentiment, he being so remote from giving "Credit to Romantic Tales, that he relates 'em with "abundance of Caution, and takes particular Care to "distinguish 'em from Truth."

"The Caverns" the preface continues "which the "Author begins with are deservedly admired by all "Curious Persons. There are various Opinions about "their Original: Some say they had been Quarreys; "others take 'em for Mines; . . . and lastly, some affirm "they were accidentally framed by Earthquakes; not "to mention the ridiculous Doctrine of Paracelsus and "others, who advanc'd, That a particular Race of Men, "which were neither altogether Spirits nod human Cre-"atures, but between both, had prepared those Cavities "for their Abode." The translator scoffs also at the supposition that these historic caves were the work of men. He derides as folly the idea that the ancients would have fetched "Stone with unspeakable difficulty "so far under Ground, when great plenty of it is to "be met with in most parts of that Country." It is explained, moreover, that "our Author (Herr Behrens) ". . . . essayed some yellow Matter found in one, call'd "the Hegers Horst, which People imagin'd to be Gold "Ore, but obtain'd nothing metallic." From these and other considerations John Andree pins his faith to earthquakes. "And, that Earthquakes, or any subter-"raneous Commotions, are capable of making such "Cavities, appears plainly from the subsidence of "Ground, which has occasion'd so many Lakes in that "Country; for before the surface of the Ground could "sink, there must necessarily have been a Cavity un-"derneath it before."

The translator crosses swords with the author when the latter embraces "the Doctrine of the Philosophica "Burgundica" as to the cause of springs of water on the summits of mountains. The author's conclusion in this matter is worded thuswise:—"Wherefore the most "plausible Opinion to me is, that the Water, being "rarify'd by the Subterranean Heat, rises in the na-"ture of a Vapour till it gets to the Summit of the "Mount, where the external Air condenses it into "Water."

"But," argues the translator "in my humble opinion "that Phoenomenon is better accounted for from the "Principles of Hydrostatics. For 'tis known, that "when two Fluids of different gravities are put into "a bent Syphon, there must be a higher Column of the "lightest to counterbalance the heaviest: Now if the "excess of the difference between the gravity of salt "and fresh Water be in proportion to the excess of the "Mountain's height above the Sea, what should hinder "Springs from bursting out there?"

Having thus disposed of the Philosophica Burgundica, Mr. Andree passes lightly over some nature faking until he arrives at the "Divinatory Rod." "The Story "of the Enchanted Hall, I doubt, will give the Reader "some Offence. As I have made already above an "Apology for Stories of that nature in general, I will "only insert here concerning the Passage of the Divin-"atory Rod, from my own Knowledge, that Dr. Weitz "(an experimenter referred to in the text) was about "23 Years of age when that happen'd to him, and in "company with other Students. Now, whether what "passed there might be the Effect of Imagination. or "of Fear, considering it was in the Day-time, and they "were all in the prime of their Vigour, I leave the "Reader to judge." The hair-raising experience of

Dr. Weitz will be narrated later on. Meanwhile, the non-committal Mr. Andree is to be admired.

Not until the Hartz Forest was found to be rich in mineral wealth were the bloody freebooters expelled. Of this expulsion the translator says:—"Which how it "was effected, and in what manner best part of this "Country came to the Line of Hannover, may easily be "learnt from History, but would be too tedious to "mention here."

And now to mining:—"With respect to the Mines, "this District is counted the richest Spot of Ground "in all Germany; for here are more than One hundred "and ten Capital Mines, several of which have Small "ones belonging to them: Some are work'd for the "King of Great Britain (as Elector of Hannover), his "own Account, and the rest farm'd out. The Mines of "Wildman Clausthal, Zellefeld, Lauenthal, St. Andre- "asburg, etc., are Silver ones, and some of them so rich "that Nine hundred thousand Rixdollars have been "coin'd in One Year from that of Clauthal only. This "Mine of Clausthal was discovered in the Year 1045, "and that of Lellerfeld in 1070. The Overseer, who "pays the Miners every Saturday, Keeps his Court at "Wildman, it being almost in the midle of them."

"The principal Produce of those Mines are Silver, "Copper, Iron, Led, and Litharge. They have many "other Minerals here, which yield also a great deal of "Money, but are very dangerous to Workmen, because "of the poysonous Vapours; as, grey Vitriol, the Ink- "stone of several colours, another sort of Vitriol solid "growing like Icicles, white Vitriol from Led Ore, Misi "of the nature and colour of Brimstone, etc.

"These are what I thought neeessary for an Intro- "duetion to this Work, which our Author had neglect- "ed in his Prefaee, he only making an Apology (the "spelling is Mr. Andree's own) there for printing the "Book, and recommending it to the Publiek." This finishes the philosophical Mr. Andree. It remains to select a few passages from the text of Herr Behrens.

The greater part of the book is made up of deseriptions, not impressively veraeious, of the natural features of the Hartz Forest. In the Index are listed such topics as "Blackberries that intoxieate," "Beer tast- "ing like Wine," "Enchanted Hall at Walkewried," "Fossile curing Witeheraft," "Idol Pustrich, or Spit- "Fire," "Iron turn'd into Copper," "Wolfs, how "eatch'd alive," and so on.

Chapter II, Part VI, contains most of the allusions to mining and metallurgy. The legend of Rammelsberg mine is here sketehed most quaintly. "The Mountain "Rammelsberg lies Southerly of the Imperial City of "Goslar. 'Tis a high, large, and on the outside un- "fruitful Mountain, Towards the top 'tis wrent in a "surprizing manner, and there is a Cleft whieh in some "places is from 6 to 8 foot wide, and 100 fathoms long, "but of such a depth that the bottom is invisible, whieh "according to the Report of the Miners, grows bigger "every Year. . . . . Some think it happen'd when, as "the Saxon Chroniele relates, the Mountain sunk, and "made in one Day 350 Widows (a cheerful way of ex- "pressing it!) whieh in a body went towards it bewail- "ing their Husbands (who were buried in the Mines) in "a most deplorable manner."

The name Rammelsberg was given the mine in the following manner. When Otho, Emperor of Germany, was holding his court not far from Goslar, he ordered one day his huntsman to chase a buek. Finding that his horse eould go no further up the mountain, the huntsman proeeeded on foot, having securely tied the horse to a tree. History does not record the fate of the buck; the action being centred round the horse. "In "the mean time the Horse, impatient for the return of "his Master, raked the Ground with his Feet, by which "means he laid bare a Metallie Vein; which the Hunts- "man pereeiving, earried a piece of Ore to the Emper- "or, who had it try'd, and thereupon began to dig "Mines there. The Huntsman's name being Ramm, "the Emperor order'd the Mountain to be call'd after "his Name Rammelsberg."

This reminds one of Larose and the fox, and of many other local Canadian legends.

A wonderful variety of minerals were found at the Rammelsberg mine. They inelude "Glittering Ore, "brown-Lead Ore, common Ore, white-Copper Ore, yel- "low Copper Ore, Copper-stone, Flinty Glimmer, white- "grey Flint, greasy Ore, red and grey Inkstone. white "and green solid Vitriol. . . . grey Coj per Ore, yellow "Misy of the nature of Brimstone, yellow Oker, Talk, "and Roeh-Alum. From these Minerals are separated "several Metals; as Gold, (but as the Mark of Silver "holds but one Farthing's worth of it, it doth not an- "swer the Expences to separate it) Silver, Copper, "Lead, Spelter, Brimstone, Cobalt, blue and white Vi- "triol, etc." From this schedule of metals the reader will be guided in guessing at the identity of the minerals.

Explosives were not used. "The Ore is sometimes "too hard for the Miners Tools, whieh obliges them to "make Fire about it, by whieh it grows brittle, and is "easily dug up. Whilst the Fire lasts, there is such a "heat in the Mines, that the Miners work quite naked; "so much the more, beeause the Water in these Mines "is of a Vitriolic nature, and so sharp that it corrodes "their Cloaths." It may be wondered what that same water did to the miners' superfieies!

(To be eontinued)

PERSONAL AND GENERAL.

Mr. H. Mortimer-Lamb, secretary of the Canadian Mining Institute, ealled upon the Hon. Mr. Hearst, Ontario Minister of Mines, on January 5th, to discuss matters conneeted with the next Annual Meeting, which is to be held at Ottawa.

Mr. O. L. Diekeson has been appointed general manager of the White Pass and Yukon Railway, and president of the loeal eompanies.

Mr. C. N. Milne, lately eonneeted with the Preston East Dome, is at present in Toronto.

Mr. Clifford Smith spent the Christmas holidays in Broekville. He is at present at the National Club, Toronto.

Mr. S. N. Graham, who is now attaehed to the Department of Mines, Ottawa, recently visited Washington and New York on official business.

Dr. W. G. Miller and Mr. C. W. Knight attended the twenty-fourth Annual Meeting of the Geological Society of America, held at Washington, D.C., on December 27, 28 and 29th. Director R. W. Brock, Mr. D. D. Cairnes, Mr. J. B. Tyrrell, Dr. T. L. Walker, Mr. W. A. Parks, Mr. W. F. Ferrier, Dr. A. P. Coleman, Prof. M. B. Baker (Kingston Sehool of Mining), Prof. Wm. Nicol (Kingston), Dr. F. D. Adams (McGill), and Dr. A. E. Barlow, were ineluded in the Canadian eontingent.

At a recent meeting of the Dome Mining Company, Mr. Ambrose Monel was elected president.

Mr. J. W. Astley has returned to Toronto after having concluded an examination of an important mining property in Eastern Ontario.

Major R. Leckie, Sudbury, was in Toronto shortly after Christmas.

Mr. Reginald Hore, Houghton, Michigan, spent several days in Toronto shortly after New Years.

Mr. E. T. Corkill, Inspector of Mines for Ontario, on information laid by Mr. T. Sutherland, Assistant Inspector, caused Mr. J. W. Vandergrift, manager of the Lucky Cross Mine, Swastika, to be arraigned before Magistrate Hartman, on Dec. 15, for violating the Mines Act. The specific offence charged was that Mr. Vandergrift had neglected properly to protect the collar of the main shaft. A fine of $100 and costs was imposed, with an option of three months hard labour at North Bay.

MINING IN ONTARIO, 1911

(Written for the Canadian Mining Journal by Thos. W. Gibson.)*

Cobalt and Sudbury have given Ontario pre-eminence in the mining industry among the confederated provinces of the Dominion. From the beginning her fertile soil made her easily first in products of the farm, and her extensive forests put her in the van for lumbering, a position which she still retains, but it is only of recent years that Ontario has really come to be regarded as a mining province. Yet in 1910 of a total mineral production for the whole of Canada of $105,000,000, Ontario was responsible for about $43,000,000, or 41 per cent. This, too, in spite of the fact that nature has been so unkind as to deny her workable coal deposits.

The fact is that there are few countries in the world which have a longer or more varied list of useful minerals than Ontario. Of the chief commercial metals, iron, copper, gold, silver, lead, and zinc are found within her boundaries, the only absentee being tin Petroleum, natural gas, salt, and gypsum are contained in her stratified rocks. The older formations, especially the Pre-Cambrian, are the home of her metals and of the other substances valuable for industrial purposes. Mica, of the amber or phlogopite variety, noted for its flexibility and resistance to the electrical current; graphite, for use in the manufacture of lubricants, stove polish, etc.; feldspar, which the potteries of New Jersey and Ohio, the makers of enamelled-ware, and even the manufacturers of artificial teeth find so useful; talc, which finds its way not only into the coated papers for illustration purposes, but also into the powder box of my lady's toilet; corundum, whose sharp bite is used by the foundry man in paring down his castings; arsenic, for insecticides and glass making; quartz, for silica compounds, and iron pyrites, for the manufacture of sulphuric and other acids, are all the bases of important local industries.

In addition to these and other products, Ontario abounds in materials of construction. It is a fortunate for comfort that in this northern climate clay for the making of brick is plentiful, and the towns and cities of the province present an appearance of solidity and durability entirely wanting in the frame-built cities of many parts of the United States. There are inexhaustible deposits of limestone for building, for lime-making, and also, where it is of suitable composition, for the manufacture of Portland cement. As an ingredient of cement, compact limestone is now largely displacing marl, which was formerly used for this purpose. There are granites for paving and monumental use, sandstones for building, and lastly, beds of marble only recently developed of surpassing beauty and great variety. The mineral wealth which nature has stored in the rocks of Ontario is serving and will serve a most useful purpose, not only in ministering to the wants of her inhabitants, but also in assisting to settle the great stretches of arable land covered with timber which form her northern heritage.

*Deputy Minister of Mines for Ontario.

Nickel.

The nickel industry has its seat in the Sudbury district. The ore is essentially a pyrrhotite and carries both nickel and copper. Mining was first begun about 1884, the ore being first regarded as one of copper, but difficulties in refining led to the discovery that it carried nickel. The industry, though steadily growing in quantity of output, has for a number of years been in the hands of two companies, the Canadian Copper Co and the Mond Nickel Co., the former an American and the latter an English concern. The Canadian Copper Company formerly worked the Copper Cliff, Evans, Stobie, and Frood mines, but now takes most of its ore from the Creighton and Crean Hill. The Creighton mine is probably the most valuable nickel mine in the world. It is worked as an open quarry and from 800 to 1,000 tons of ore are raised per day. Crean Hill is more valuable for copper than for nickel, while the Creighton ore is the reverse. The smelters are at Copper Cliff, and are of the most modern and up-to-date character. The Mond company's works are at Victoria Mines, but are in process of being removed to a point east of Rumford where the Canadian Northern crosses the Canadian Pacific. Both companies operate their mines and works now almost entirely by electrical power, derived by the Canadian Copper Company from the Spanish, and by the Mond Nickel Company from the Vermilion River.

The combined output of nickel in 1911 is estimated to have been about 18,000 tons, slightly less than in 1910. The demand at the close of the year, however, was active, and both companies are working at their full capacity. The ore is roasted in heaps to get rid of the sulphur, then put through the blast furnace and subsequently converted into Bessemer matte containing about 45 per cent. nickel and 35 per cent. copper. The mattes are refined by the Canadian Copper Company in New Jersey, and by the Mond Nickel Company in Wales. The only serious rival to Ontario in the nickel industry is New Caledonia, a French island in the southern Pacific Ocean. The New Caledonia ore is quite different from that of Sudbury, being a silicate, and carries no copper. Formerly it was exported to England, Germany, and France for treatment, but works have recently been erected for converting the ore into matte before shipment, thus avoiding freight charges on useless material. Discoveries of rich nickel ores have recently been reported from Greece.

Silver.

There have been three eras of silver production in Ontario, the first beginning with the discovery of Silver

Islet, where out of a speck of land off the north shore of Lake Superior, about $3,500,000 worth of silver was extracted. Silver Islet mine has a romantic story, but long ago filled up with water and remains so to this day. Other discoveries followed on the mainland west of Port Arthur, where the Rabbit Mountain, Silver Mountain, Beaver, Badger, and Porcupine mines were worked in the days when silver was worth twice as much as it is now. In 1903 the silver discoveries at Cobalt astonished the world by their richness. The mines were opened in 1904 and the production quickly rose from 250,000 ounces in that year, to 31,500,000 ounces, the estimated output of 1911. In all, up to the present time about 125 or 126 million ounces of silver have been obtained from Cobalt, worth about $65,000,000. The ore-bearing formations are conglomerate, diabase, and Keewatin. Much the larger number of the productive veins occur in the conglomerate, but excellent ore has been found in the other two varieties of rock. The veins vary in width from a fraction of an inch to a foot or more, and in length up to 700 or 800 feet. Their vertical dimensions are less easily ascertained, but at the Temiskaming mine good ore has been obtained at 575 feet in depth. Recent developments in the geology of the camp have shown that an important fault occurs in the conglomerate on the La Rose, Cobalt Lake, and McKinley-Darragh properties. The effect of this is apparently to enlarge the area of workable ground on these claims, and it is possible that further operations may disclose ore at much greater depth than had formerly been deemed probable.

For 1911 the producing mines were much as in previous years, Nipissing, La Rose, Coniagas, Kerr Lake, Crown Reserve, Buffalo, Hudson Bay, etc., etc. In some of the productive mines of Cobalt the shareholders have received back again in dividends more than the amount of the original stock, and the total return to the shareholders has been greater than 50 per cent. of the gross receipts from silver sold, that is to say, out of $65,000,000 worth of fine silver produced, upwards of $33,000,000 has been paid in dividends.

The camp is making rapid progress in concentration and refining methods. At the start nothing was shipped but high grade ore, and the low grade material went to the dumps. Now there are some fourteen concentrators at work, and two others in course of construction, having a capacity of about 1,400 stamps in all. Most of the low grade ores, that is those containing from 20 ounces upwards, are concentrated, though there still continues a demand for low grade ore from western smelters in need of silicious material for fluxing purposes.

It may be that the highest point of production in Cobalt has been reached, but there is no apparent reason why silver should not be produced in very considerable quantities for many years to come.

The outlying camps—South Lorrain on the east, and Gowganda on the west—have been less productive than Cobalt, but Wettlaufer on the one hand, and on the other Millerett and Miller Lake-O'Brien, have been fair producers. The extension of the T. & N. O. branch into Elk Lake should stimulate the silver industry on the Montreal River, where concentration methods are likely to be in demand from the beginning.

From the other minerals in the Cobalt ores—arsenic, cobalt, and nickel—the mine owners have derived little benefit. The price of arsenic has fallen to two cents a pound and less, and the price of cobalt oxide has sunk to a low level, less than one-third of the figure at which it stood when Cobalt was discovered. Most of the high grade ores and concentrates are now refined in Ontario, there being four well-equipped refining plants, situated at Copper Cliff, Deloro, Thorold, and Orillia. Silver bullion is being shipped not only from these works, but also in increasing quantities from the camp itself. O'Brien and Nova Scotia have been producing merchantable bars for some time, and during the year were joined by Nipissing, which developed a novel and ingenious modification of the amalgamation process for recovering the silver. The price of silver during the year showed comparatively small variations; it opened at 52.79 cents per ounce in January and closed at about 54.5 cents. The market for Cobalt stocks remained dull throughout the year and prices are now at low levels.

Iron.

Slower progress is being made in developing the iron ore industry of Ontario. The ranges of iron formation in the north and northwest are extensive, but the bodies of workable ore as yet located are comparatively few. The Helen mine and Magpie in Michipicoten, Atikokan west of Port Arthur, and Moose Mountain north of Sudbury, are types of such deposits, varying in character and differing probably in origin. The hematite ores from the Helen are being smelted at Sault Ste. Marie. At Magpie and Moose Mountain plants are being installed for raising the grade of the ore as mined, and the ore from the Atikokan is roasted before going into the furnace. The iron mines of eastern Ontario made no shipments during the year. It is probable that concentration methods will eventually be employed for the treatment of these deposits, preferably by a suitable plant centrally located. The ore shipped amounted to probably 300,000 tons for the year.

Copper.

In copper the only productive source at present is the Sudbury district, the ore of which carries copper as well as nickel. About 9,000 tons of copper were contained in the mattes produced by the nickel companies in 1911. There are numerous deposits of copper ore in the district between Sudbury and Sault Ste. Marie, also in other parts of the Province, which do not carry nickel, but the low price which for some time has prevailed for copper, does not offer sufficient inducement for the working of these mines, the ore of which for the most part is low grade, and is carried in a silicious gangue.

Gold.

Gold mining is entering upon a new stage in Ontario. Hitherto, it must be confessed, the history of this branch of mining has been disappointing. Gold is found scattered over many parts of the Province, especially in the north and northwest, but the high hopes which have been raised by successive discoveries have, one by one, been doomed to disappointment. Madoc, Lake of the Woods, Seine River, and lesser camps have had the same experience. Porcupine, however, where gold was found two years ago, is holding out greater promise, and would, no doubt, have been producing bullion ere now had it not been for the forest fires which ravaged that district last July and which destroyed the plants at the Hollinger, Dome, and other mines. There is no doubt that large bodies of gold-bearing quartz exist at Porcupine, and as the Hollinger and Dome mills will shortly be dropping their stamps, gold bricks will be in evidence during 1912. The Ontario Government has met the urgent necessity for improving transportation into Porcupine, by build-

ing the T. & N. O. extension from Iroquois Falls. At Swastika, Munro, and Larder Lake developments have been going on, and bullion is expected from all of these places this year. At Sturgeon Lake, the St. Anthony mine, which lay idle for some years, has been taken over by a Toronto syndicate with very good prospects for success.

The list of metals in Ontario was extended during the year by the discovery of mercury in some of the cobalt ores of the Nipissing mine, and by the finding of scheelite, one of the ores of tungsten, at the Jupiter mine, Porcupine, by Mr. A. G. Burrows, a member of the geological staff of the Bureau of Mines.

Petroleum.

The petroleum industry has been for long a staple one in Lambton county. The wells there were opened over 45 years ago, and about six years ago Tilbury East and Romney townships proved to contain oil. But the yield in both fields is steadily declining, and in the newer field the rate of diminution has been greater than in the older one. Twenty years ago the production of crude in this province was 35,000,000 gallons, while in 1911 it was probably not in excess of 10 000,000 gallons. Much the greater part of the crude required by the refineries in Ontario is imported from the United States. The oil-bearing formations in southwestern Ontario have great thickness and are of wide extension, and it is quite possible that new pools will be discovered. The past history of the field warrants such expectations.

Natural Gas.

The counties on the north shore of Lake Erie constitute the natural gas fields of Ontario. In 1910 the product was valued at about $1,500,000, and in 1911 the yield was probably worth about $2,000,000. Welland, Haldimand, Norfolk, Elgin, and Kent all contribute to the supply, the most productive counties being Kent, Haldimand, and Norfolk. The gas is piped to Hamilton, Brantford, Galt, Chatham, Windsor, Walkerville, and other towns and villages, and about 250,000 people of the southwestern peninsula enjoy the advantages of an ideal fuel and a good light, at an average of about 25 cents per 1,000 cubic feet.

Salt.

The salt industry maintains from year to year a fairly uniform production of about 80,000 or 85,000 tons, worth $400.000, or $450,000. The chief point of production is Windsor, but there are many smaller plants along the eastern shores of Lakes St. Clair and Huron. There is unlimited scope for expansion in those branches of the chemical industry which use salt as raw material, for instance in the making of soda, soda-ash, bleaching powder, etc. The necessary limestone is abundant.

Gypsum.

The gypsum beds in the valley of the Grand River are being worked more extensively than in previous years, the demand for this article in the Portland cement manufacture having given a stimulus to production. The output in 1910 was 10,043 tons, but the figures for 1911 will show an increase.

Building Materials.

Building materials continue to be produced annually in such quantities as are required. One of the chief seats of brick-making, and also one of the largest markets for the finshed product, is Toronto, where building for the last few years has been extremely active. The brickyards in the suburbs of this city have not been able to supply bricks as fast as contractors required them.

The advantages of tile draining are now recognized by the farming community, and tiles are being made in increased quantities. The manufacture of lime has, like other industries, been concentrated of late years. The old fashioned lime-kiln which the farmer and his son operated at odd times, has been replaced by large plants scientifically constructed and operated. The manufacture of Portland cement has undergone a wonderful increase during the twenty years since it was established in Ontario. The output for 1910 was nearly 2,500,000 barrels, and for 1911 will no doubt be still greater. Stone quarries are feeling the competition of cement, and of late years their output has not been increasing.

There are other branches of the mineral industry in Ontario of considerable importance, but it is scarcely necessary to pursue all the details. It is perhaps sufficient to say in conclusion that year by year this industry is attaining a more important position in the Province, and that there is no reason to think its future history will be less striking than it has been up to the present time. The undeveloped mineral resources of Ontario are undoubtedly great. Other Cobalts, other Porcupines, other Sudburys, and possibly other petroleum and salt fields, may await in northern Ontario the coming of the prospector, on whose hope-inspired and unwearying labours the mineral industry has its rock-bottomed foundation.

THE COLLIERY MANAGER (NEW STYLE).

A Topical Song.

(Music from "Pinafore"—"A British tar is a soaring soul.")

Editor's Note.—Our Nova Scotian correspondent very thoughtfully forwarded us a copy of the following topical song, which was rendered at the yearly gathering of the officials of a large English colliery. "The new Mines Act," says our correspondent, "which "has just passed the House of Lords in England, is "a very grandmotherly piece of legislation, and, al "though the complaint of the colliery manager i "humorously put, there is a good deal of truth in hi "complaint."]

TENOR.

A manager is an anxious soul,
As free as a caged bird;
An apologetic moan must be ready to atone
For a dictatorial word.
His eyes may flash with a suppress'd fire,
His soul with wrath be wrung;
But he must not speak with a domineering frown
Or the sting of an angry tongue.

BASS.

The collier smiles as he smokes and spits;
He grins a bit while his brow he knits;
For pleasant little sums his thoughts engage,
While he chuckles as he reckons up his minimu
wage.

CHORUS.

He slaps his thigh, though he makes his growl;
He rubs his hands, though he tries to scowl:
For he feels he's Boss—and he's, oh, so rude!
And this is now his customary attitude.

TENOR.

A manager is a captive soul
Chained fast to his pit in fact;
He cannot be away for a single blessed day
(According to the new Mines Act);
He must inspect every working place,
He must be everywhere;
He must see each man gets a reasonable wage
Though he neither try nor care.

BASS.

And then his owner grunts and groans,
(And he's not forbidden to indulge in frowns)
Every cost-sheet puts him in a greater rage
As he reckons up the working of the minimum wage.

CHORUS.

He slaps his thigh as he makes his growl;
He wrings his hands with a fearful scowl:
For he gets neither money nor gratitude;
And rage is now his customary attitude.

TENOR.

A manager is a weary soul
And often is sick at heart;
Though he may do his best he may one fine day
Be condemned if he fail in part.
He must know every science from A to Z
A jack-of-all-trades must he be;
He must ventilate the mine, in Mechanics he must shine
And eke in electricitee.

BASS.

The Inspector comes on his frequent round,
The men's representatives are always underground;
He's watched like a dog from dawn till dark,
But a dog which may neither bite nor bark.

CHORUS.

He scratches his head and he thinks a bit,
"It's the worst job on earth to manage a pit;
It's not well paid," and we must conclude
That he sometimes takes a discontented attitude.

TENOR.

A manager is a worthy soul,
With a lot of British pluck,
Though he's got a lot to do, he intends to see it through

BASS.

If he's only some decent luck.
He knows his calling's a noble one,
He stokes the Ship of State,
He makes the steam for the railway train,
And he fills the poor man's grate.

BASS.

(rall. & p.)

It's a perilous trade, and who knows so well
The dangers which one day may sound his knell;
But he keeps a brave heart for he knows that he
Keeps the lives of all those hundreds in the colliery.

CHORUS.

(a tempo)

But from time to time he unbends a little bit
He meets old friends and forgets about the pit;
He's no one to worry or to persecute
He's as happy as a sandboy at our Institute.

COBALT AND PORCUPINE SHARES DURING 1911.

(Written for the CANADIAN MINING JOURNAL by E. D. Warren & Co.)

Practically the only important feature in mining markets during the past year was the introduction of Porcupine stocks. These issues were first listed during the early spring, when Hollinger made its appearance. This stock was underwritten at $3.50 and rapidly advanced, with temporary setbacks, to more than four times its initial price.

Shortly after the successful introduction of Hollinger, Preston East Dome was underwritten at 30 cents, and a few days after it had been listed on the exchanges, sold up to 57 cents. This flotation was quickly followed by others, the most successful of which were Dome Extension and Rea. The Foley-O'Brien, Dobie, West Dome and others met with cool receptions, the public having absorbed all the Porcupine stocks it could in the absence of any production or extensive developments. However, those stocks which had been listed continued to hold fairly steady, and in some cases showed advances, until news of the great fire which swept over the district caused much shrinkage in values. Since then the market has been to a very large extent a professional one, with here and there a slight renewal of public interest.

The Cobalts have been exceedingly quiet, and with one or two exceptions, the stocks of that district have greatly declined in price during the year. Coniagas and McKinley-Darragh have been the most sought after by investors in Cobalt. While the production of the camp has been less than that of previous years, the dividends for 1911 were greater by $2,000,000 than the dividends for 1910. However, the speculative features which formerly made the issues of this district so attractive have been absent, and the purchases have been made by investors who are satisfied to receive a fair return on their money and entirely disregard the speculative factors which are of such importance to most investors in mining shares.

Since the fire, the companies operating in Porcupine have laid broad and deep foundations for the future and the time is almost at hand for production to commence. With the mills of half a dozen companies in commission, as they will be during the next six months, Porcupine is bound to take on more and more importance in the estimation of investors, and the bull market which is confidently predicted for the early part of the coming year will presumably develop into one of the strongest and most active markets seen in mining shares in a number of years.

INSTITUTION OF MINING AND METALLURGY
ANNUAL DINNER

About 230 sat down to the annual dinner of the Institution of Mining and Metallurgy, held at the Savoy Hotel, London, December 15th. The chair was taken by Mr. H. Livingstone(Sulman, who was supported by Sir Alfred Keogh (Rector of the Imperialy College of Science and Technology), Sir Robert Morant (secretary of the Board of Education), Dr. W. C. Unwin (President of the Institution of Civil Engineers), Mr. S. Z. de Ferranti (President of the Electrical Engineers), Dr. R. Missel (President of the Society of Chemical Industry), Sir Carl Meyer, Sir Gerard Muntz (President of the Institute of Metals), Dr. C. A. Keane (Principal of the Sir John Cass Institute), and various Past and Vice-Presidents of the Institution.

Sir Alfred Keogh, in proposing "The Institution of Mining and Metallurgy," said it was the custom among Britons wherever they might be to form themselves into societies and associations, and a similar course was taken by people who followed a particular line of work or branch of study. Their object was to maintain their own honour and—what was often forgotten—to maintain the public interest. In the professions of those present, as in his own, there was grave necessity that every individual should have a high standard of honour, and that, in addition to guarding their own interests, pay special attention to the interests of the public. He was not going to launch out upon his favourite subject of mining education, but he might mention that next month the Bessemer Memorial Committee would hand over to the Royal School of Mines the magnificent laboratory which they had presented to the Imperial College of Science and Technology. He was glad to think that the institution had been first to establish a close connection between scientific education and industrial work. Moreover, the institution had formed an Advisory Board to confer with the college authorities and prevent them from following too academic lines.

In responding, the Chairman remarked that they could not have had the case for the continuance of their institution more convincingly stated than it had been by Sir Alfred Keogh. He would not trouble them with many statistics, but might quote that the world's production of gold alone since 1880 had exceeded£1,-000,000,000, and over one-half of that huge amount had been won from mines within the British Dominions. The British capital involved in metalliferous mining, apart from coal and iron, during the same period approached, if it did not exceed, £900,000,000. From such figures it was obvious that the magnitude of the financial interests which determined their work could only be reckoned in millions. Moreover, the major proportion of those vast sums was controlled from London. The rapid growth of the institution evidenced the need felt for self-protection on the part of those engaged in the mining industry; in all there were now 2,200 members—actual or in course of training. The speaker concluded with some pungent references to self-conferred diplomas.

Dr. Unwin, responding to the toast of "Our Guests," said there had been a stone age, a bronze age, iron age, and now they had been born into the steel age. He supposed that the iron age had lasted from before the Roman time down to the middle of the last century. The great fabric of civilization rested upon the great metallurgical interests which they represented—(applause)—and as an instance of this he pointed out that Russia, with all its great area, used not more than a twelfth of the amount of steel which was used by either Great Britain or Germany.

THE WORLD'S PRODUCTION OF IRON

An interesting return was issued recently containing a memorandum and statistical tables showing the production of iron ore and pig-iron and the production of steel in the United Kingdom and the principal foreign countries in recent years and the imports and exports of certain classes of iron and steel manufactures, from which it appears that the combined output of iron ore in the ten principal countries dealt with exceeded 125 million tons in 1909, and if the output of the minor producing countries be added, it is probable that the world's total output in that year was about 130 million tons. The world's output in 1909 was thus about 2 1-2 per cent. below that of the year 1907, but the figures so far available indicate that the output in 1910 was well above that of 1907. The principal producers were the United States, Germany, the United Kingdom, France and Spain, in the order given, these five countries producing about six-sevenths of the total output of the world.

Complete particulars in regard to the production of iron ore in 1910 are not yet available. In the case of the United States, the output in 1908 was about 30 per cent. less than in 1907, but in 1909 there was an almost complete recovery and the output in 1910 was over 11 per cent. above that of the year before. In the case of Germany there was a partial recovery in 1909 from the sharp reduction of output shown in 1908, and the output in 1910 was well above that of any previous year. In the United Kingdom and in Spain the output in 1909 was even less than in 1908, but the British output in 1910 was only about 3 per cent. below that of 1907. In France the rapid increase shown in the production for several years before 1908 has been resumed. The marked reduction of the Swedish output in 1909 as compared with 1908, adds the report, was due to the great strike which occurred in Sweden in that year.

It is noted that relatively to population, Sweden has a production of iron ore considerably in excess of the other nine chief countries, amounting in 1910 to nearly one ton per head of the population; in the United States the production was about three-fifths of a ton per head; in Germany the yearly output was well over two-fifths of a ton per head, and in the United Kingdom about one-third per ton per head. It is remarked that in 1891 the quantity of ore mined in the United Kingdom, was slightly greater than in Germany, though less than in the United States. Since 1896, however, the output of Germany has outstripped that of the United Kingdom, and since 1902, with the exception of the years 1904 and 1908, the output of the United States has considerably exceeded that of the United Kingdom and Germany combined. The maximum output in this country was reached in 1882, when it amounted to over 18 million tons. It is now about 15 million tons.

With the regard to foreign trade in iron ore, the position of the countries included is very different. At the two extremes stand Spain and Belgium. The former exports nine-tenths of her output, the latter imports almost the whole of the iron ore she requires for the purposes of her iron and steel industries. Of the remaining countries, Sweden exports about four-fifths of her production, and in the case of Russia the exports have for the last eight years been considerably in excess of the imports. The United Kingdom, France, Germany

and the United States are all importing countries, though in different degrees. The first derives about one-third of the ore she utilizes from abroad, her exports being only trifling. The exports from France have increased considerably of late years, but about one-eighth of the ore smelted in 1909 was derived from abroad. The exports from Germany (which are sent chiefly to Belgium and France) are considerable, but are largely exceeded by the imports. The United States is nearly independent of foreign sources of supply.

With regard to the world's production of pig-iron last year, it is estimated at about 65 million tons, the principal countries of production being the United States, Germany and the United Kingdom, in the order named, these three countries together accounting for about four-fifths of the total output of the world. The United States accounted for 27,304,000 tons, Germany (including Luxemburg) 14,556,000 tons, the United Kingdom 10,012,000 tons and France 3,969,000 tons. The report goes on to remark that iron enters into foreign trade mainly in forms other than that of pig-iron. By far the greater part of the iron produced is converted into steel, and this conversion takes place mainly in the country where the pig-iron is produced. Taking the average of the last five years, in the United Kingdom about 56 per cent. of the pig-iron made was steel-making iron (haematite, basic pig, spiegeleisen, etc.), in France about 64 per cent., in the United States about 74 per cent., in Germany about 76 per cent., and in Belgium about 83 per cent.

The differences are partly due to the special suitability of Continental ores for making basic steel, but also to the relatively greater importance of the wrought iron and cast iron industries in the United Kingdom. Not only did the exports of forge and foundry pig iron amount in 1910 to about 8 per cent. of the total output of pig-iron of all kinds in the United Kingdom, but it may be estimated that about 26 per cent. of the iron made and retained in the country was used for foundry purposes, compared with 23 per cent. in the United States and with 19 per cent. in Germany. The exports of pig-iron from the United Kingdom are greater than the total exported from all other countries included in the tables contained in the report, and, on the average of the five years 1906 to 1910, amounted to 1,448,000 tons per annum, or 14.7 per cent. of the total British production.

The combined output of steel in the United Kingdom, Germany and the United States for 1910 exceeded 46 million tons, and the world's output may be estimated at between 59 and 60 million tons.

EFFICIENCY IN ORE ROASTING*

By ARTHUR S. DWIGHT.

This is a study of the relative efficiencies of some of the more important desulphurizing methods used in the metallurgy of lead and copper, to prepare the ore for smelting. It is proposed to show how these efficiency factors have served to shape the development of the roasting process from the crude and inefficient method of burning ore in heaps, through the multifarious forms of reverberatory furnaces, up to the recently devised systems of blast-roasting.

The exact purpose of the roasting operation is not always the same; thus in roasting lead ores, it is usually desired to eliminate as much of the sulphur as possible, in order to avoid making, in the smelting operation, an undue quantity of matte, a troublesome by-product which locks up valuable metals that ought to have been set free in the metallic product, and thus calls for an extra treatment to recover these metals. With copper ores, on the contrary, a matte is the logical product of the first smelting, and hence it is customary to leave a definite remnant of the sulphur to "cover" the copper and prevent unnecessary losses of metal in the slag. Again, on account of the greater fusibility of lead ores, and the ease with which lead may be volatilized and lost, a more careful heat regulation is necessary in their treatment, and this tends not only to lower the efficiency factor of a given type of furnace, but definitely to debar certain types from service with lead ores. However, these variations are no greater than those which may be caused by the varying skill shown in design and operation, and we may, therefore, neglect them for the purposes of the present discussion. It is sufficient to say that the relative efficiency factors here deduced will be approximately true for either lead or copper ores, though special metallurgical requirements may dominate the choice of apparatus.

The roasting capacities of different types of furnaces depend upon the same general principles, viz.: (1) the quantity of ore that can, within a given period of time, be effectively exposed to the oxidizing influence of the air, and (2) the rapidity with which the oxidizing action can be effected. Large area of hearth and frequency of stirring are the means generally employed for increasing the quantity of ore thus exposed, while careful control of the heat and air supply, fine crushing, and intelligent regulation of the chemical composition of the ore mixture contribute to the speed of oxidation.

Dr. E. D. Peters thus summarizes the fundamental requisites for rapid and efficient roasting: "(a) small ore particles. (b) A vigorous air current, which shall also sweep away the residual nitrogen of the spent air and the sulphur-dioxide gas which would dilute the atmosphere in contact with the ore so that its oxidizing power would lose its efficiency. (c) Frequent stirring of the ore, for, after the removal (approximately) of the first atom of sulphur from the pyrite—which atom is driven off by heat alone—the oxidation of the ore proceeds with discouraging slowness as soon as the upper layer of sulphide particles has become partially oxidized."

To determine the relative efficiency of different types of furnaces requires us to go a step further than the mere capacity of the furnace, as the question of fuel, labour, repairs, interest charges on the plant and on the value of metals locked up in the process, and finally the character of the product, have an important bearing. Many of these factors are variables, even when considering the same type of furnace under different conditions; hence it is difficult to select one factor which will tell the whole story. Taking everything into consideration, the best factor we have is the number of pounds of ore treated per day on a square foot of the furnace

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hearth. This factor involves the time-element, which must necessarily enter largely into the make-up of most of the other factors, and it also involves the factor of size which gives a certain measure of the size of the furnaces and the buildings required for handling a given tonnage, and this, in turn, is a rough index of the first cost of the plant. As regards the important question of fuel, a "free-burning" ore will, when charged into the hot furnace, take fire and burn without any external fuel being required; and, although certain styles of furnaces are more suitable for propagating and maintaining this reaction than others, the actual efficiency factor will not be materially different whether all of the necessary heat is supplied by the sulphur in the ore itself or by coal burned on the grate, though the cost of roasting will probably be much higher when the external fuel is used. Again, the character of the roasted product, its fineness or coarseness, is a matter of great importance. If the blast furnace is to do its best work, it must be given material reasonably coarse and preferably cold. The reverberatory smelting furnace, on the contrary, does best when the charge is made up of hot fires. The smelter of copper has the choice of both types of smelting furnaces, but the smelter of lead is limited to the blast furnace, and hence is likely to be much more solicitous that his roasting operations shall yield him a coarse product. Briquetting the fine roasted ore has helped him to secure this desideratum, but this, in turn, has involved a separate and expensive operation, which results not entirely satisfactorily, so that briquetting is adopted only with reluctance. Other things being equal, that furnace which will turn out a products in coarse form is entitled to a long credit mark, and this may surpass in practical importance its efficiency factor.

We may divide those roasting methods which are tinent to this discussion into four principal classes:

I. Roast heaps and stalls.

II. Reverberatory roasters:

(1) Hand-stirred furnaces. (Hand-reverberatory.)

(2) Mechanically-stirred furnaces of diverse styles.

(3) Revolving cylinders. (Brückner, etc.)

III. Blast-roasting in pots by the Huntington-Heberlein, Savelsberg, Carmichael-Bradford and McMurty-Rogers methods.

IV. Blast-roasting of thin layers (Dwight-Lloyd System).

(1) Intermittent down-draft pans.

(2) Continuous-sintering machines.

It is not intended to describe in detail the different methods and furnaces here referred to, but merely to indicate those points which relate to this discussion, as well as those which are necessary to show the basis for calculating the efficiency factor.

I.—The Roast Heap.

This is the most primitive form of roasting appliance, requiring practically no plant but the area of ground upon which the coarsely broken ore is piled on a layer of cordwood to kindle it, and covered with a layer of finer ore to control the degree and direction of the draft. Some of the irregularities of heap-roasting may be prevented by conducting the operation in masonry stalls with paved floors containing air ducts, and sometimes a system of flues connected with a chimney to assist the draft and dispose of the noxious sulphur gases, but the principles involved and the efficiency factors are about the same. The bulk of the ore in the pile must be coarse, to permit the free passage of the gases. From the very nature of the operation, no rabbling or stirring is possible during the roasting, for which reason the results is discharged, streaks of imperfectly roasted material will be found which must be sorted out and subjected to a second fire and sometimes a third. This sorting and re-treatment may be considered as an archaic form of stirring or rabbling. Sometimes the same result is obtained more efficiently by successively stripping off the outside of the heap where the ore naturally roasts more quickly and effectively than in the interior. By thus scraping off the outer layers as fast as they are finished, the inner portions are successively given this same advantage until the entire pile is consumed.

Cheap and plentiful labour, though not necessarily skilled, is an essential when so much handling and re-handling is called for, but granted this, the cost of roasting a ton of ore in heaps may be as low as by the most modern and approved methods in spite of its low efficiency factor. The physical character of the product is generally favourable for the blast furnace, being coarse and spongy. Heap-roasting is frequently found to be an effective aid in getting a new metallurgical enterprise started quickly, on account of the absence of complicated plant, but is seldom used as a permanent method, at least under competitive conditions, because labour is usually not sufficiently cheap and plentiful. Losses by wind and by the leaching of soluble metallic salts by rain may be serious, particularly with copper ores. The great objection to heap-roasting, however, is that it is so slow that the interest charge on the capital locked up in the ore undergoing treatment becomes a serious item of expense. In other words, its efficiency factor is low. For this discussion, we may take the efficiency factor at 5 to 20 pounds per square foot of are at best extremely irregular. When a finished heap hearth area.

To illustrate this most primitive method, we may select the practice of heap roasting at Goslar, Lower Harz, Germany. The heaps are 35 to 40 feet square at bottom and 12 feet square at top, with a thickness of about 6 feet, resting on a layer of cordwood and faggots 16 to 20 inches thick, the whole being heavily blanketed with a thick layer of fines. The contents is about 400 tons. First roasting lasts 6 to 7 months, after which the unroasted portion is sorted out and directed to a second and even third fire of shorter duration. The "hearth area" is regarded as equivalent to the area of the average horizontal section of the pile, here taken at 872 square feet. Conceding that with favourable conditions and skillful manipulation the entire contents of the pile might be satisfactorily roasted in the first period of six months duration, the efficiency factor will be:

$$E = \frac{800{,}000 \text{ lb.}}{872 \text{ sq. ft.} \times 180 \text{ days}} = 5.1 \text{ lb. per day sq. ft of hearth}$$

There are examples of more efficient heap-roasting than this, for the Goslar practice prolongs the roasting period to what seems an unnecessary degree. The explanation is probably found in the fact that the recovery of part of the sublimed sulphur was attempted. This result would be promoted by heavy blanketing of the exterior by means of the layer of fines and this would naturally make the roasting slow.

In commencing our series of efficiency factors with the heap roast at 5 lb. per sq. ft. per day, we do with the further explanation that in other localities heap-roasting has been brought up to a relatively high degree of perfection, so that the efficiency factor may easily run as high as 20 pounds per square foot per day, and cases are on record where it has approached very close to the efficiency factor of the hand roasters, next to be described.

II.—REVERBERATORY ROASTERS.

The prototype of all the furnaces of this class is the German long hearth reverberatory furnace, the so-called *Fortschaufelungsofen*. This has a long rectangular hearth covered by a low, flat, reverberatory arch, with a fire-box at one end and an exit-flue at the other, and numerous working doors on both sides to admit the long handled tools for stirring or rabbling. The ore is fed to the furnace near the exit-flue, spread out in a thin layer on the hearth, frequently stirred to expose new surfaces for oxidation, and gradually moved by the rakes and paddles toward the fire bridge when it is exposed to the highest desirable heat just before being discharged. The labour of rabbling is severe in the extreme, and it was natural that efforts should have been made to relieve the workmen and accomplish the stirring by mechanical means. This gave rise to a great variety of mechanical roasting furnaces, of all shapes and sizes, and employing widely different mechanical devices for moving and stirring the ore, but the principle underlying all of the furnaces of this general type, both hand- and mechanically-operated, is the same.

From this point of view it will be interesting to observe how the efficiency factors of these highly developed forms of automatic roasting furnaces compare with one another, and with their own prototype, the hand roaster.

Hand-Stirred Reverberatory.—The general features of this furnace have been already described. The earlier furnaces were smaller than those of later construction, but a length of 65 feet and a width of 15 feet were found to be the practical limits of hearth area, and very few improvements have been made in this furnace during the past 20 years. By reason of the greater flexibility of hand-rabbling, this furnace has been found peculiarly suited to roasting lead ores, and in spite of all the efforts that have been made, in the interest of economy of labour, to adapt the many automatic furnaces to this service, the hand roaster has remained, almost to this day, the one trusted and reliable roaster for the lead metallurgist, that is able to meet any situation that may arise. It is costly to operate, both as to fuel and labour, and occupies an enormous area in proportion to its output (i.e., its roasting efficiency is low) but it is reliable. Another reason for its long popularity is the favourable character of its product. By care in making up the charges, and skill in regulating the heat at the finish, the particles of roasted material can be discharged in a sort of nodulized condition which is considered reasonably favourable for the blast furnaces.

One modification of this furnace which was extensively used in the West for some years was the slagging roaster, which was originally used at the Omaha & Grant Smelter, Denver, Colo. This consisted of a combination of a reverberatory melting hearth next to the fire bridge, and a long flat hearth in which the preliminary roasting was effected by the waste gases from the fusing-box. The ore, during roasting, was gradually moved toward the fusing-box, and finally scraped in and melted in batches, forming a slag which was drawn into pots, and, when cold, was sent to the blast furnace. This product was highly appreciated for its coarse mechanical condition, but the practice was finally abandoned on account of high metal losses. It was an interesting development, however, as an illustration of the price the lead metallurgist was willing to pay for a coarse smelting material.

The capacity of a typical hand roaster with a hearth 60x15=900 square feet was about 12 tons per 24 hours or 26.6 pounds per square foot per day. Collins gives the following comparative factors of efficiency, in pounds per square foot per day: Przibram, Bohemia, 31; Laurium, Greece, 28; Port Adelaide, Australia, 12; Cockle Creek, Australia, 29; Colorado Smelting Company, Pueblo, Colo. (Eilers plant), 37; St Joseph Lead Co., Bonne Terre, Mo., 30; No. 3 Monterey, Mexico, 24; Murray plant, Utah, 24. We may, therefore, take the efficiency factors for hand roasters as between 24 and 35 pounds per square foot per day.

Mechanically Stirred Reverberatories.—The development of the automatic roaster from the hand-reverberatory has been already referred to. The line of improvement follows almost exclusively the one idea of more frequent stirring of the ore. Again to quote Dr. Peters. "What I wish to point out in this immediate connection is that this question of a more frequent stirring of the ore was the one glaring fault in our roasting practice of 30 years ago, and, that, really, almost the entire energy and ingenuity of the inventors and users of automatic furnaces were focussed upon this single point. All the wealth of science and of modern mechanical skill has been brought to bear upon the exposing of fresh particles of ore to heat and oxygen as frequently as is needful, and has been successful."

Mechanically stirred furnaces had been used many years ago in England, principally for roasting tin ores, but apparently at that time they did not fit into the requirements of the copper and lead business, or, if so, it was to a very limited extent. The Parkes, original MacDougall, and Brunton furnaces were invented at that time, and have served as the prototypes of some of the most successful of the modern automatic furnaces. The O'Harra was developed in the early days of Butte, Mont., and became the prototype of another series of adaptations. In fact, there was a voluminous crop of patent furnaces, and almost every metallurgist of renown had one of his own. The rivalry was intense, and furnished an interesting and probably a necessary chapter in the history of American metallurgical practice. Some of these furnaces had commendable features, but the chief praise that could be given to most of them was that they were "different." Of the many that once bewildered the metallurgist, a few that had the requisite combination of merits have survived. These merits are simplicity, durability and low repairs, low first cost and satisfactory efficiency. A glance at the table of relative efficiencies of these automatic furnaces will show that there was an exceedingly small range of variation among the different styles, considering the extent of the effort that was made for improvement. The following table gives representative figures of efficiencies (pounds per square foot per day) for furnaces of different styles operating under widely different conditions, in both lead and copper work.

EFFIECIENCY OF FACTORS OF VARIOUS STYLES OF MECHANICALROASTERS.

	Collins.	Kern.
Brown-Allen-O'Hara	34	74
O'Harra, Butte, Mont.	—	33- 36
Brown horse-shoe	48	35- 38
Brown horse-shoe (treaing matte)	38	
Pearce turret (treating matte)	43- 55	60- 66
Ropp straight-line, Port Pirie, Australia	95	
Ropp straight-line, Hanauer, Utah	33	
Ropp straight-line, general conditions	60	67- 77
Keller-Cole-Gaylord, Germania, Utah	104	44- 48
Heberlein, light roast	150	
Heberlein, Sullivan, B.C.	169 (1)	
Godfrey, Murray, Utah	54- 80	
Godfrey, Australia	141	
Wethey, original		60- 65

Wethey, improved	65- 70
McDougall, Evans-Kleptko, Anaconda, Mont.	84 86
Edwards	140-152
Herreshoff-McDougall	30- 35

It is evident, therefore, that we may safely claim for furnaces of this class an efficiency varying from 33 to 75 pounds per square foot per day for ordinary conditions, and as high as 150 pounds per square foot per day when but little sulphur elimination is required. This latter figure may properly be used in making comparisons with the blast-roasting processes.

Revolving Cylinder Roasters.—As exemplified by the Brückner cylinders, this type of roaster was very popular at one time both in lead and copper work, but is now almost entirely abandoned. The high proportion of flue-dust made by the Brückners was one of the principal causes of the gradual abandonment of this method of roasting. It is to be regarded essentially as a revolving reverberatory furnace in which the inner lining of the cylinder becomes successively the hearth and the reverberatory arch of the furnace, and the exposure of fresh surfaces of ore is accomplished by the changing talus of the material as the cylinder slowly revolves. The area of the hearth may be taken for practical purposes as equivalent to the horizontal projection of the cylinder.

At the Germania plant, in Utah, the Brückner practice attained its highest perfection. Here the cylinders were 22 feet long by 8½ feet diameter, and treated 12 tons per day. Equivalent area of hearth was 187 square feet, making the efficiency factor 128 pounds per square foot per day.

To summarize the characteristics of the automatic roasters of the reverberatory type, we may say that they show a distinct gain in efficiency over the hand-stirred type, though the gain is not so marked as one would expect. The truth is that a practical limit is soon reached as to the amount of sulphur that can be burned on a square foot of hearth area in a given time without causing the sulphides to melt and interfere with the further progress of the reaction, or clog the stirring mechanism. This practical limit probably corresponds closely to the efficiency factor of 75 pounds per square foot per day, though in certain special cases where the ore contains less sulphur, or from its nature will bear a higher temperature without fusing, or where there are special provisions for moderating the resulting temperatures, (as in some of the improved types of MacDougall furnace, notably the Wedge furnace), the efficiency factors may be carried as high as 175 pounds per square foot per day.

III.—Blast Roasting in Pots.

The last paragraph called attention to the great stumbling-block in the way of increasing the efficiency of the mechanically stirred reverberatory, arising from the too rapid generation of heat by the mass-action, whereby the sulphide is caused to melt or "matte." The next important advance in the art of roasting resulted from the discovering how to control and check this mass-action. It was accomplished by mixing the grains of sulphide to be roasted with grains of an inert or refractory material in such proportion that the particles of sulphide are held apart from one another by refractory grains. If a mass of material so constituted be ignited at one surface and a blast of air forced through it, the sulphide particles will successively shrivel up in the fierce oxidizing blast, and the reaction will propagate itself through the mass in the direction of the air current. An additional advantage may be secured if the isolating grains are of such composition that, while they remain inert during the roasting period, they will, at the temperature developed by the cumulative mass-action, combine with the newly formed metallic oxides to form a reasonably fusible slag or sinter. This is the action as we now understand it, but at first the reason for the extraordinary rapidity of the roasting was not so evident. Instead of recognizing it as a purely mechanical effect, Messrs. Huntington and Heberlein, who first developed this process, were misled into the belief that some powerful chemical reagent was at work, and that the burnt lime they employed as an isolating ingredient of the charge was the vehicle for nascent oxygen in the form of CaO_2. So sure were they of this fact that they based their patents in all the important countries of the world upon this reaction, and the theory was generally accepted as true until research demonstrated that it was untenable. Even then it was generally held that the lime had some important though mysterious chemical effect, and the process was still called "Lime Roasting." It has now been demonstrated that many other substances will answer as well, if not better than lime, and "Blast Roasting" is now generally accepted as the more logical and precise designation.

Although Messrs. Huntington and Heberlein did not realize at first the true cause of their success, they are none the less entitled to great credit for working out a successful process which constituted a great step in advance, and removed some of the most perplexing difficulties of the lead metallurgist. They made it possible to roast fusible galena ores cheaply, efficiently and with diminished metal losses, yielding a product of remarkably favourable physical character, which greatly promoted the efficiency of the subsequent smelting. Although the form of apparatus they employed (blast-pots) was crude and primitive, the efficiency factor was far higher than had ever been previously attained by what Dr. Peters has referred to as the "wealth of science and modern mechanical skill," as applied to the roasting problem.

The procedure originally proposed by Huntington and Heberlein required a pre-roasting of the charge before treatment in the pots, but as experience was gained in manipulation it was found possible, under some conditions, to dispense with the pre-roast and subject the charge to direct converting. The variations in the process devised by Carmichael and Bradford in Australia, and by Savelsberg in Germany, dispensed with pre-roasting. The first named investigators noticed that sulphate of lime was quickly formed in the converter, and reasoned that it might as well be introduced at the start in place of the burnt lime. Savelsberg carried this reasoning still further, and substituted crushed limestone. Patents were granted to all of these investigators, and their processes have found extensive utilization. But the efficacy of the lime was unquestionably overestimated, and its true function misunderstood.

The original Huntington-Heberlein pot was small and deep. As the roasting and sintering action propagates itself progressively upwards, the time needed to complete a charge depends more upon the distance which this slowly moving zone has to travel than upon the actual weight of material treated. The present writer has shown in a previous article that, on account of this progressive sintering, most of the space in a converter is utilized for storing rather than for treating its con-

tents. It was to be expected, therefore, that the improved forms of pots developed by later experience should be larger and shallower. As the depth was diminished, however, the proportion of unsintered fines tended to increase, and this tendency limited the improvement in that direction. The reason for this is found in the fact that the gases escaping at the top of the pot keep the loose particles on the top surface in constant agitation and thus prevent the close brooding contact which is necessary to secure complete sintering. With a modern 10-ton pot, 9 feet diameter by 4 feet deep, the proportion of fines will usually amount to about 10 per cent., sometimes as high as 25 per cent.

The pot discharges its product in the form of a huge cake of sintered material, which requires considerable hand labour to break into suitable size for smelting, even after a preliminary shattering of the sake has been accomplished by dropping it from a height. On account of its coarseness and its more or less cellular structure, the pot product is highly prized as material for the blast furnace.

The initial sulphur in a properly proportioned blast-roasting charge should not be higher than about 18 per cent. if the most efficient results are to be obtained, and this fact should be kept in mind in comparing the efficiency factors with those of the older types of roasters. As already stated, the most favourable efficiency factor of the automatic reverberatory roasters (175 pounds per square foot per day) may properly be used in making comparisons with blast roasting results. The grate in the bottom of the pot, through which the air enters the charge, is much smaller than the diameter of the pot, and as there is a very complete diffusion of the air through the charge it seems only proper in calculating the equivalent hearth area of a pot, to use the area of the average horizontal section, just as was done in the case of the roast heaps, previously discussed.

The published figures of costs and capacities of the early Huntington-Heberlein work show some serious discrepancies, and are usually much more favourable than the same process and presumably improved practice. The following cases have been selected as fairly showing the range of capacities:

Huntington-Heberlein.—Converters hemispherical 9 ft. diameter by 4 ft. deep, holding 8 tons material. Grate 6 ft. diameter, but assume equivalent hearth area (7½ ft. diameter) 44 sq. ft. Time of blowing 12 to 18 hours. Allow 1½ turns per day. Hence, capacity is 12 tons per day per converter, and efficiency factor is 545 lb. per sq. ft. hearth area per day.

Huntington-Heberlein, Trail, B.C.—Converters, 8 ft. 8 in. diameter by 4 ft. deep, hold 12 tons. Equivalent hearth area 44 sq. ft. Capacity 15 tons per day per converter. Efficiency factor 680 lb. per sq. ft. per day.

Savelsberg.—Pots, 8 ft. diameter, contain 8 tons; equivalent hearth area, 38.5 sq. ft. Time of blowing 18 to 20 hours, say 1¼ turns per day, or 10 tons per day per converter. Efficiency factor is 520 lb. per sq. ft. per day.

McMurty-Rogers.—Pots, 8 ft. 8 in. diameter by 4½ ft. deep; take 8-ton charge. Equivalent hearth area, 44 sq. ft. Time of blowing 12 hours. Assume 1¾ turns per day; capacity is 14 tons per day per converter. Efficiency factor is 636 lb. per sq. ft. hearth per day.

Roasting-boxes, Bingham Junction, Utah.—Hearth area, 36 sq. ft. Capacity 16 tons per day. Efficiency factor 890 lb. per sq. ft. per day. (Considerable percentage of fines requiring re-treatment).

From the above figures we draw the conclusion that the average efficiency factors for pot-roasting lie between 500 and 900 pounds per square foot per day, with average probably close to 600 pounds. This is indeed a remarkable gain in efficiency over the best work of the reverberatory furnace under equivalent conditions of sulphur elimination, and fully justifies the verdict pronounced by Prof. Joseph W. Richards in 1908 that pot roasting was "the most radical improvement in recent years in the metallurgy of lead."

IV.—Blast Roasting of Thin Layers.

Attention has here been called to two of the weak points of the pot-roasting procedure caused by the use of the thick layer, viz.: The ineffective utilization of the space in the converter, and the massiveness of the cake produced. Very early in his efforts to devise a means for adapting the blast-roasting idea to the treatment of copper fines, the present writer came to realize the economic importance of finding a means for *completely sintering a thin layer,* in order to eliminate these two objectionable features. When a thin layer, say 4 in. thick, was treated on an ordinary grate with up-draft, the bottom 2 inches would be sintered and the upper 2 inches would remain pulverulent. This was the net result of the efforts of many who experimented in this line. Finally it was found that by applying a mechanical means for holding quiescent the particles which had usually remained unsintered and maintaining them in close contact with one another, a complete agglomeration could be effected. It was found that this could be accomplished by restraining screens with up-draft, but the simplest way was to constitute the supporting grate the restraining screen by reversing the usual direction of the air-blast and passing the air downwards. This completely solved the problem. It had the beneficial effect also of automatically preventing channelling and the formation of blow-holes. The resulting gain in efficiency was remarkable. When the principle was applied to shallow down-draft pans operating intermittently, the results were much superior to the best work of the pots, the product was more porous and easily broken to the desired size, and, on account of the lesser mass-action and greater heat radiation of the thinner layer, a wider range of chemical composition was permissible. Further study along these lines pointed out the way to making it a *continuous* process, and this has still further increased the efficiency factor, so that the final result achieved shows almost as great an improvement over the pots as these had previously shown over the best automatic reverberatories.

Intermittent, Dwight-Lloyd Down-Drift Pans.—The intermittent procedure has been tried generally in an experimental way or as a preliminary to the adoption of the continuous process, by which the former has almost invariably been superseded. Accounts have been published of two sintering plants that were designed to treat thin layers intermittently, following the procedure described in the fundamental patent of Dwight and Lloyd.

One of these plants was that built at Cerro de Pasco, Peru, in 1907, under an arrangement with the owners of the Dwight-Lloyd patents, but following independent designs. The description is incomplete and the figures not entirely consistent, which is probably explained by their being taken from a Peruvian government report. The installation appears to have been not very satisfactory, and did not operate long. The reasons are sufficiently clear.

The other plant was built at Port Pirie, Australia, by the Broken Hill Proprietary Company, to be used in

connection with the Carmichael-Bradford gypsum process. It has since been superseded by the Dwight-Lloyd continuous process without gypsum. Its efficiency factor was about 1,800 pounds per square foot per day.

The principal reason why the efficiency factor of the intermittent apparatus is lower than that of the continuous is because of the time lost in the former by the operations of charging, igniting and discharging, and the difficulty of knowing just how the process is progressing and when it is finished. This loss of efficiency has been found to be 30 to 50 per cent. Under reasonably favourable conditions the writer has found the efficiency factor of the down-draft intermittent method to be 1,000 to 2,000 pounds per square foot of hearth per day.

Continuous Process.—No attempt will here be made to describe the details of this method. It is sufficient to say that in the method now generally used a thin layer of the ore is fed on a continuously moving conveyor, with grated bottom, travelling over an air-tight box connected with an exhaust fan, which causes air currents to be drawn down through the layer of ore and the grate upon which it rests. Immediately after the stream of ore emerges from the feed hopper its level top surface is ignited by momentarily passing under an igniting device. Thenceforward the heat necessary for the propagation of the roasting and sintering reaction is derived from the internal combusion of the sulphur or other combustible ingredient of the charge. The speed of travel is so regulated that when a given portion of ore has travelled across the suction box to the point of discharge, the zone of sintering action has progressed down to the grates, and the operation is complete. The fact that all the adjustments are reduced to mechanical terms makes it possible to keep the closest watch on each condition independently and quickly to correct any departure from normal.

RESUME OF EFFICIENCY FACTORS.

I. Roast heaps and stalls	5 to	20 lb.	Good
II. Reverberatory Roasters:			
(1) Hand roaster	24 to	35	Fair
(2) Mechanically stirred:			
average conditions	33 to	75	Too fine
special conditions ...		150	Too fine
(3) Revolving cylinders ..		128	Too fine
III. Blast roasting pots	500 to	900	Excellent
average		600	Excellent
IV. Blast roasting of thin layers (Dwight-Lloyd system:			
(1) Intermittent down-draft pans	1000 to	2000	Excellent
(2) Continuous sintering machines	2000 to	3000	Ideal

The hearth area for purposes of calculation is the horizontal area of the layer undergoing treatment, which is the same as the top area of the suction box. Assuming average figures for specific gravity of ores and for sulphur contents, a standard Dwight-Lloyd sintering unit (type E, 42 X 264 in.), with an effective grate area of 77 square feet, will easily treat 85 tons per day of average suitable material without a preroast, which is equivalent to an efficiency factor of 2,200 pounds per square foot hearth area per day; while with a charge corresponding to those with which the best results are obtained in the pots; the capacity runs as high as 120 tons per day, equivalent to an efficiency factor of 3,000 pounds per square foot per day.

MINES BRANCH

List of Publications issued during 1911.

69. Chrysotile—Asbestos: Its Occurrence, Exploitation, Milling, and Uses (Second Edition)—by Fritz Cirkel, M.E.—pp. 316; illustrations 154; maps 2.

82. Bulletin No. 5: Magnetic Concentration Experiments with Iron Ores of the Bristol Mines, Que.; Iron Ores of the Bathurst Mines, N.B.; A Copper Nickel Ore, from Nairn, Ont.—by G. C. Mackenzie, B. Sc.—pp. 28; illustrations 4.

84. Gypsum Deposits of the Maritime Provinces—by W. F. Jennison—pp. 171; illustrations 55; maps 3.

88. Annual Report of the Division of Mineral Resources and Statistics on the Mineral Production of Canada, during the calendar year 1909—by John McLeish, B.A.—pp. 291.

89. Proceedings of Conference on Proposed Legislation on the Manufacture, Importation, and Testing of Explosives; Held House of Commons, Sept. 23, and Sept. 30, 1910—by Dr. Eugene Haanel—pp. 41.

92. Investigation of the Explosives Industry in the Dominion of Canada, 1910—by Capt. Arthur Desborough—pp. 16.

93. Molybdenum Ores of Canada—by Dr. T. L. Walker—pp. 64; illustrations 24.

102. Preliminary Report on the Mineral Production of Canada for the Calendar year 1910- -by J. McLeish, B.A.—pp. 21.

103. Mines Branch Summary Report, 1910——pp. 237; illustrations 17; map 1.

114. Production of Cement, Lime, Clay Products, Stone and other Structural Materials in Canada, 1910—by J. McLeish, B.A.—pp. 60.

115. Production of Iron and Steel in Canada during the Calendar Year 1910—by J. McLeish, B.A.—pp. 38.

116. Production of Coal and Coke in Canada during the Calendar Year, 1910—by J. McLeish, B.A.—pp. 31.

117. General Summary of the Mineral Production in Canada during the Calendar Year 1910,—by J. McLeish, B.A.—pp. 37.

Reports now in the Press

83. The Coals of Canada: An Economic Investigation—conducted at McGill University, under the Auspices of the Dominion Government—by Professors J. B. Porter and R. J. Durley,—and others. In six volumes:—

Vol. I.—Coals: Sampling, crushing, washing, mechanical purification, and coking trials.

Vol. II.—Coals: Steam boiler, producer, and gas engine trials, also Chemical Laboratory work.

Vol. III.—Coal Washing Tests: Tables and Diagrams.

Vol. IV.—Boiler Tests: Tables and Diagrams.

Vol. V.—Producer and Gas Engine Tests: Tables and Diagrams.

Vol VI.—Chemical Tests: Tables and Diagrams.

100. Report on the Building and Ornamental Stones of Canada—by Professor W. A. Parks.

104. Catalogue of Publications of Mines Branch, from 1902 to 1911: containing Tables of Contents, and List of Maps, etc.

110. (Bulletin No. 7) Western Portion of Torbrook iron ore deposits, Annapolis County, Nova Scotia—by Howells Frechette.

111. Diamond drilling at Point Mamainse, Ont., by A. C. Lane, Ph.D., with Introductory by A. W. G. Wilson, Ph. D.

118. Mica: Its occurrences, exploitation, and uses—by Hugh S. de Schmid.

143. Annual Report on the Mineral Production of Canada during the Calendar year 1910—by J. McLeish.

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt, South Lorrain, Gowganda and Elk Lake.

With one or two exceptions the Cobalt camp now possesses no properties on a purely speculative basis; the money that has been diverted to the gold mines and the gold prospects of the province left the companies operating with the public's money with no alternative but to shut down. The Canadian speculator too has learned much wisdom by experience and will not now bite at every hook that is dangled before his eyes. And so it comes to pass that while the dividends taken out of the camp and distributed to shareholders from one end of Canada to another and all through the Eastern States are in aggregate larger than last year, the amount of money put into the ground and into the pockets of promoters is less. On a profit and loss account the year 1911 was much the most profitable that the premier camp of Ontario has as yet seen.

It is one of the most creditable features of the camp that each successive rise in the production has meant a commensurate increase in the aggregate dividends paid; the public has benefited by every advance either in the amount produced or the skill in mining that keeps down the costs in spite of a lower grade of ore.

	Production.	Dividends.
1909	$12,356,422	$6,308,316
1910	15,000,000	7,902,000
1911	16,000,000	8,395,585

It will be seen from the above table that whatever gain has been made in production the Cobalt shareholder has had his fair proportion of the advantage.

Last year saw the first scientific attempt to solve the problem of reducing the low grade ore of the camp to dollars and cents. All the big dividend paying mines of the camp have been content to make their profits out of nothing less than 30-ounce ore and allow the lower grade to remain on the dumps or in the stopes. This year the experiments at the Nipissing and the Nova Scotia, in every way successful, to amalgamate first and afterwards cyanide the tailings has rendered the treatment of 15-ounce ore remunerative. Next year will see another step forward in the process of scientifically picking up the scraps that are falling from the rich man's table, when the 200-ton mill of the Nipissing is in operation. It by no means denotes that the dividend paying mines are now running out of high grade and have to fall back upon the crumbs but it does show that the banqueters see that unless they mix their rich wines with water and tone down the rich viands with more modest fare there is an end of the feast within measurable distance.

Taking property by property there has been very little change in the past year. To the north of the west ridge the Temiskaming and Hudson Bay was able to submit a very business like report last October. It went to show that during the first year the new mill had been in operation a gross value of $424,488 had been produced at a cost of 14.7 cents an ounce, leaving a net profit to the shareholders of $288,972. As several new veins have been discovered during the year it is most probable that this production will be maintained next year. A 300 per cent. Temiskaming and Hudson Bay dividend only calls for $23,283, so that it is easily seen that the property is likely to raise the record of the payments several thousands per cent. yet.

It is to the Coniagas, perhaps, more than any other mine in the camp that 1911 was so far the apex year for the Cobalt camp both in dividends and production. After a long period of probation the Coniagas suddenly emerged last year as a 9 per cent. per quarter dividend payer with ore reserves in sight for years ahead. It seemed that every drift commenced, widened, and every crosscut started was sure to find ore. Though the Coniagas is to-day milling on an average 186 tons per day it is yet so rich in streaks that more than half the produuction still comes from the mine ore that is hand-picked in the mine and goes direct to the Thorold smelter. The progress of the Coniagas when set forth in production and ore reserves is very remarkable. Last year while nearly 4,000,000 ounces were mined it is very probable that as much was put in sight. Here are the figures:

	Production.	Ore Reserves.
1908-1909	1,407,228	12,557,700
1909-1910	1,929,531	15,368,400
1910-1911	3,789,273	15,750,000

It is true that when Mr. R. P. Rogers made his estimate it looked too good to be true, and he reduced it by 20 per cent. to be on the safe side, but the first estimate in view of the new ore bodies that have been found in new territory is the more likely to be correct. If the 20 per cent. were allowed off it would mean that practically all the ore taken out of the mine had not been offset by any ore put into sight last year at all, which, in view of the prolific character of the Coniagas ground would be most improbable. And not only is the Chairman of the Transcontinental Commission's mine producing at an extraordinary rate, but it is turning out the silver at a profit only equalled by the Crown Reserve and the Kerr Lake, when they were mining their half bullion veins. The 3,789,273 ounces produced last year from 25 acres of the West Ridge cost the company only 8.8 cents per ounce. As the price of silver advanced from one to two cents last year it is easy to see that the Coniagas will have no difficulty in maintaining its $1,440,000 dividend requirements for several years to come. It will next year join that select and delectable brotherhood of Cobalt mines that have more than redeemed their capitalization. To-day that list reads:

	Per Cent.	
Buffalo	137	$1,337,000
Crown Reserve	215	3,626,061
Kerr Lake	124	3,720,000
Nipissing	129	7,740,000
T. & H. B.	190,000	1,474,590

Next year should see the Coniagas and McKinley-Darragh join the hundred per cent. rank, while the Trethewey will only have to increase its gait by two per cent. to enter the same distinguished company.

While the Trethewey cannot compare in opulence to its neighbours to the west or the south—the Coniagas and the Nipissing—it has found new strength this year in the discovery of several ore bodies not hitherto suspected to exist or at any rate only dimly foreshadowed in previous development. The mill is now producing at the rate of 2,000 ounces a day in addition to mine ore, and in a report made two months ago by the general manager, Mr. Charles O'Connell, it was stated that there was underground two years' supply of ore for the mill and another year at the present rate of a hundred tons per day upon the dumps. It is anticipated that next year the Trethewey will not only redeem its old capitalization, but will make one of the mines producing a million ounces in the twelve months. The Buffalo, the first property on the West Ridge to attain its maturity as a producer had no difficulty in maintaining its production to its dividend levels and still carry a good surplus. It produced in the year 1910-1911 over a million and a half ounces, and there is little doubt that it will be able to maintain that figure in 1912. The mill treated during the year 41,484 tons averaging no less than 36.07 ounces per ton. In spite of the continued production on a large scale, Mr. Tom Jones was able to report at the end of last year that the ore reserves had been increased by 1,118,000 ounces principally on the No. 10 vein which has developed very satisfactorily.

While the City of Cobalt has been disappointing, the Cobalt Townsite bids fair to develop into a miniature Buffalo. Under the control of English interests little faith has till the

last year or two been placed in the mine and it was consistently starved in the belief that the less spent, the less wasted. Under careful management the property that was believed to possess no future has now yielded 750,000 ounces in the past fiscal year and for the coming twelve months will yield at least a million ounces. As so far no English company in the Cobalt or Northern Ontario silver field has paid a dividend the possibility that this property may do so has a significance. The principal discoveries have been made right on the Buffalo line but before Mr. Redington resigned the management he blocked out some good ore in the shaft near the Right of Way which can be taken out at any time. Most of the revenue of the mine comes from the concentrates shipped from the Northern Customs concentrator where a contract has been made to treat 75 tons per day.

Without any hastening of the pace or apparent exhaustion of reserves the McKinley-Darragh has been able to make 1911 their apex year by 20,000 or 30,000 ounces. It is scarcely likely that the dividend record of 50 per cent. in a year will be maintained, but with the growing worth of the Savage 40 per cent should be easily maintained next year. Like all the properties in the Huronian, shallowness of ore body appears to be more than counterbalanced by the multiplicity of veins or veinlets in quite extensive ore bodies. The mill is treating 125 tons daily of about 36 ounce ore, and very little mine ore is shipped from the McKinley, all goes through the mill. The Savage on the other hand yields the high-grade mine ore with less extensive fissuring and values in the wall rock near the veins.

The Cobalt Lake has built a mill and shown remarkable activity in shipping low grade ore. What the returns from the smelters have been will be known only when the annual report is published.

What the Nipissing has lost on the east side of the lake it has gained on the west where the Meyer, the Fourth of July and Vein 100 are showing unexpected resources. The north side of the Nipissing is no longer a collection of shafts, but a closely connected system which will have its low grade centre at the big 200-ton mill which will be ready for use on Nipissing Hill by about November. What little prospecting was undertaken on the surface was conducted for the most part in second-class territory and no tangible results were obtained. So successful has been the treatment of the high grade ore in the plant established under the direction of Mr. Charles Butters on Nipissing Hill that in addition to producing about two million ounces a considerable amount of customs ore was taken and treated. While paying 30 per cent. a year the Nipissing has been able to build up a surplus of a million and a half dollars. There has been no gouging of the mine to produce the 4,710,074 ounces to their credit this year, and the $226,000 net taken out monthly has often been provided and set aside ahead of time.

GENERAL MINING NEWS

QUEBEC

Montreal.—The first meeting of the representatives of the Canadian, English and American bondholders of Amalgamated Asbestos is being held in New York to talk over a reorganization plan to be submitted to the bondholders.

Mr. H. J. Fuller will represent the Canadian protective committee; Mr. J. E. Aldred, the English Committee, while Mr. U. H. McCarter, of the Prudential Trust Co., of New York, will look after the United States interests.

It will likely take several more conferences before a satisfactory plan is formulated, but everybody feels hopeful that the bondholders will in the end hear of a plan that will meet with their hearty endorsation.

Canadian bonds amounting to over $1,000,000 have been deposited with the National Trust Co., and the amount is expected to grow considerably. The more bonds the Canadians have behind them the better.

ONTARIO

Hamilton.—Hamilton is to be made the steel and wire centre of Canada.

This announcement has been made by Mr. Robert Hobson, general manager of the Steel Corporation of Canada, who states that the erection of two new open hearth furnaces of fifty tons' capacity a day each will be commenced at once; also a 32-blooming mill, a billet mill and a combination rod and bar mill. The buildings are to be erected by April, and the mills will be in operation by next October. Employment will be given to 1,000 additional skilled workers.

Later on it is intended to erect factories for finishing wire goods.

The company has a big staff of engineers laying out the grounds for other large buildings.

Haileybury.—Two additional 50-horse-power boilers are being set in position by the Casey-Cobalt mines, at their property north of New Liskeard, which gives the company as good a plant as many of the mines in the Cobalt camp. There was some talk among the directors of installing a mill on the property to treat the large amount of low grade ore that is being mined but the matter has not been settled, and it is hardly likely that the concentrator will be built during the present winter.

Cobalt.—The London Times contains a statement of the estimated production of the Townsite of Cobalt, indicating that it will produce about $500,000 worth of silver per annum at a cost of about one-third of the amount produced. This would make the net profits considerably over $300,000 per annum.

The Cobalt Townsite is the first British company operating at Cobalt to be put on a dividend basis.

Cobalt.—For the year 1911 the Cobalt Townsite Mining Company, one of the two companies in Cobalt controlled by English capital, will produce almost a million ounces. Not more than a year and a half ago it was considered a dead prospect. The fiscal year of the company ended on October 31, and this year the company produced $393,000 net. The production for the calendar year will almost certainly exceed that amount. The company now has a contract with the Northern customs mill at Cobalt whereby the latter takes 75 tons per day of the Townsite low-grade ore and treats it. As the mill is within a few feet of the Townsite's main shaft, there is little cost in the handling. The heads at the mill ran 28 ounces to the ton, which leaves a handsome profit.

The total weekly production of the mine is now running about 21,000 ounces per week, or about $11,000. There is also definitely blocked out in the mine about a million and a half ounces of silver. The Townsite has probably made a bigger gain in production and ore reserves than any other property in the Cobalt camp for the year 1911. The stock of the company held in England is widely scattered and the good results now being obtained from the mine should have a beneficial effect on other British investments in Northern Ontario.

Porcupine.—The Ontario Gazette announces the incorporation of the Timmins settlement, directly opposite the Hollinger mine, on Miller Lake, as a municipality. This will be the first settlement in the whole of the gold district to attain that dignity, the other centres of population not caring to incur the responsibilities of municipal life until they are set firmer on their feet. The first town in the gold camp elected its first Mayor on January 7, the nominations having taken place by a special dispensation on January 1.

The new town will include the Campbell Veteran property,

on which the settlement is situated, the Hollinger mine, the Dixon claim and the Miller Middleton; in fact, all the holdings of the Timmins-McMartin-Dunlap syndicate in the section. As a town it will, of course, be precluded from sharing in the royalties exacted from the mines in the township of Tisdale, but on the other hand, the township of Tisdale will not be allowed to take toll of the share of the profits from the mines within the boundaries of the town; that will go to the new municipality.

ALBERTA

Lethbridge.—As a result of the discovery of coal near Cardston, that place will be the headquarters of the Cardston Coal & Coke Co., which will be shortly incorporated to handle the proposition. R. E. McArthur, civil engineer here, will be the leading figure in the new company. Other members of the corporation will be Alf. Smith, J. Brodie, H. M. and W. A. Whiddington of Lethbridge, and Benjamin Street, J. L. Leavitt and William Laurier of Cardston. The new company will be incorporated with a capital of $150,000. They have just recently received the leases for the property in question and will commence development work immediately.

BRITISH COLUMBIA

Hedley.—The Hedley Gold Mining Company has declared a regular dividend of three per cent. with an additional dividend of seven per cent. This makes a total disbursement of 25 per cent. for the year. The new ore discovery under the bunk house, continues to open up in good shape, and hold the grade of value. So far as yet shown, it appears to be a separate and distinct ore body, and bids fair to add materially to the quantity of ore in sight. The lower workings of the Nickle Plate with the latest finds in that part of the mine are also doing their share to make conditions particularly rosy. The new policy of keeping development well ahead of the extraction is proving satisfactory.

Rossland.—Ore assaying $73 to the ton in the Richmond property owned by Sam Forteath and others, and a carload from the Blue Bird—belonging to Lyman Carter of Spokane—which yielded $1,180, or $45 a ton, formed a recent record of the Rossland south belt. The year 1912 will, it is hoped, witness the commencement of active mining operations in this section of the camp.

Victoria.—The Canadian Collieries (Dunsmuir), Limited, has let contracts in connection with the development of a hydro-electric water power in Comox district, Vancouver Island, British Columbia. The construction work now in progress includes making a dam and constructing a water line, the latter to be three miles long. It is intended to develop 11,000 horsepower and to use the power at the coal mines of the company's Union colliery, near Cumberland, and for other purposes.

In the same district the company is sinking a shaft, to be about 1,000 feet in depth, this development being in connection with the intended opening of a new mine, from which, however, it will not be practical to obtain coal until at least a year from now. Money has been appropriated for much other work with the object of putting the mines in condition to materially increase their regular output of coal.

Meanwhile production is being maintained on a similar scale to that of 1910, in which year the company's gross production was 898,908 long tons of coal, of which 380,482 tons was from the mines of its Extension colliery and 518,426 tons from those of its Union colliery. There is an active demand for all coal mined at the several collieries operating on Vancouver Island.

NOVA SCOTIA.

[Editor's Note.—This summary is reprinted from the Halifax Morning Chronicle, which at the close of each year publishes an exceptionally complete review of industrial progress in Nova Scotia. Mr. H. B. Pickings, Deputy Inspector of Mines, is the author. Incidentally, we can hardly agree with Mr. Pickings' methods of valuing the mineral output of the Province—especially in the items of steel, iron ore, and coke.]

The mineral production of Nova Scotia for the year 1911 shows a large increase over the production of the year 1910, and is the largest in the history of the mining industry of the Province. The different branches of the industry, with but three exceptions, show largely increased outputs, whereas the decreases shown are very small. With the exception of iron ore, pig iron, steel, prices have been the same as during the preceding year.

The Coal Output.

A total of 6,400,000 tons of coal were mined, this being an increase of 700,000 tons over the production of 1910. The Dominion Coal Company took over and reopened the mines of the Cumberland Railway and Coal Company at Springhill, and has during the year opened three new mines in Cape Breton County. This company had at the close of the year fifteen producing mines and five mines in stage of development on the Island of Cape Breton. At Stellarton the Acadia Coal Company has been engaged in extensive alterations and additions to its equipment, electrifying the plant. At North Sydney the MacKay Mining Company has completed and is now operating a coal briquette plant.

The production of coke for the year was 500,000 tons, an increase of 55,000 tons over the 1910 production. The principal producers and users of coke in the Province are the Dominion Iron and Steel Company and the Nova Scotia Steel and Coal Company.

Iron Ore Production.

A total of 840,000 tons of iron ore was imported into the Province; 140,000 tons more than the amount imported during 1910, and 40,000 tons of ore was mined in the Province, this being 10,000 tons less than the amount mined during 1910.

Pig-Iron and Steel.

400,000 tons of pig iron and 445,000 tons of steel ingots were made, being increases of 50,000 tons and 33,000 tons respectively. The iron-ore, pig iron and steel markets throughout the world have been dull, and prices consequently low.

At Torbrook the Canada Iron Corporation has completed an ore concentrating plant. This company, in August, on account of the unsatisfactory condition of the iron market ceased to operate its mines. Operations are to be resumed just so soon as the market conditions improve.

Gypsum and Gold.

The output of the different gypsum companies was 310,000 tons, a decrease of 15,000 tons from the production of 1910. The industry is in a healthy condition, and preparations are being made to open new quarries and increase productions.

Gold mining has not been engaged in as extensively as in 1910, and the production of 7,500 ounces shows a decrease of 3,000 ounces when compared with the production of that year. The closing of the Richardson mine at Goldboro and the Sterling mine at Oldham, the two largest producers in 1910, reduced the 1911 production by approximately 6,000 ounces. Present indications are that there will be a somewhat larger production during the coming year.

Building, monumental, and paving stone quarries, produced 10,000 tons, being a slight increase over the 1910 production.

The brick yards of the Province produced 23,000,000 bricks, and 1,200,000 feet of different sizes and styles of tile, drain, conduit and sewer pipe, both increases over the 1910 production.

The Tungsten Mines.

At Scheelite, Moose River, the Scheelite Mines, Ltd., continued the development commenced last year in connection

with its tungsten areas. Additional shafts have been put down and long levels driven, good ore has been encountered, a modern concentrating mill and power house have been constructed, the equipments placed and the plant is now in operation. Ore shipments will be made early in the New Year.

At New Ross, the Nova Scotia Manganese Company has lately completed a concentrating mill and power house, and has part of the machinery in place; recent development work at the mine has opened up large bodies of high grade pyrolusite. This company is now prepared to make shipments of ore.

At Lake Ainslie, Cape Breton, the Barite, Limited, has recently completed a modern mill and expect to commence shipment of its products early in 1912. The milling of barite at the mine is a new departure for the Province; in the past all ore being shipped from the mines in a crude state.

Value of Mineral Products.

The following table shows the approximate values of the mineral production of the Province for the year:

Coal	$19,200,000
Steel	8,900,000
Pig Iron	4,800,000
*Iron Ore	2,475,000
Coke	2,200,000
Quarry products	880,000
Gold	142,000
Clays	190,000
Mis. Scheelite, Manganese, etc.	100,000
Total	$38,887,500

*120,000 Nova Scotia ore balance imported.

The mineral industry of Nova Scotia is year by year becoming of greater importance. Booms, such as occurred at Cobalt, Porcupine, etc., are practically unknown here, the expansion and growth being gradual and along conservative lines, and people not directly connected with some branch of the industry seldom realize its importance. Nowhere else in the world, in so small a territory, are so many kinds of minerals found in economic quantities, and few countries of its size equal in value its mineral production. Mining and metallurgical practices throughout the Province are well abreast with the times, and will bear comparison anywhere.

Notwithstanding the flourishing condition of most branches of the industry, there is plenty of room for expansion and growth, particularly in connection with gold, oil shale, gypsum, iron, and copper deposits.

There are at the present time no serious labour troubles at any of the mining centres, and the general outlook points to greater productions for the year 1912.

STATISTICS AND RETURNS

B. C. ORE SHIPMENTS.

With last week's ore shipments the total for the year 1911 reached 1,451,710 tons for the mines of the Kootenay and Boundary districts. The smelter receipts for the year total 1,351,429 tons.

This week, ending December 30th, the Granby mine and smelter appear on the list for the first time since June last, when the shortage of coke caused by the strike in the Crow's Nest Pass caused the shutdown.

The last week of the year saw several new properties on the shipping list for the first time during the 12 months. The Molly Gibson mine at Coryell, near the international boundary line, which has constructed a new mill recently, shipped 22 tons. The new shippers from the Slocan were the Neepawa, the Madison, the Livingstone and the Ophir. The Standard mine again figured on the list with a heavy shipment, being credited with 191 tons and 300 tons milled. The Whitewater shipped 42 tons.

Boundary Shipments.

Granby	9,442	599,855
Mother Lode	5,198	312,695
Unnamed	104	15,213
Emma	721	1,023
Other mines	....	114,611
Total	15,465	1,043,397

Slocan-Kootenay Shipments.

Sullivan	48	16,618
St. Eugene, milled	420	26,496
Richmond-Eureka	31	2,212
Rambler-Cariboo	30	1,688
Queen, milled	420	21,530
Granite-Poorman, milled	420	13,010
Emerald	45	2,095
Standard	191	1,137
Knob Hill	163	5,415
Molly Gibson (Coryell)	22	22
Molly Gibson (Nelson)	47	1,142
Van Roi, milled	800	38,449
Arlington (Erie)	28	237
Madison	3	3
Neepawa	14	14
Whitewater	42	63
Livingstone	5	5
Ophir	6	6
Standard, milled	300	1,500
Other mines	....	18,338
Total	3,055	149,980

Rossland Shipments.

Centre Star	3,394	195,168
Le Roi No. 2	57	27,828
Le Roi No. 2, milled	300	15,600
Le Roi	659	19,235
Other mines	....	502
Total	4,410	258,333

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	5,198	312,695
Unnamed	104	15,213
Emma	721	1,023
Other mines	....	102,777
Total	6,023	430,708

Consolidated Co.'s. Receipts.

Trail, B.C.

Centre Star	3,394	195,168
Le Roi No. 2	57	27,828
Sullivan	48	16,618
St. Eugene	64	6,671
Richmond-Eureka	31	2,212
Knob Hill	163	5,415
Molly Gibson (Nelson)	47	1,142

Queen	38	869
Standard	191	1,137
Van Roi	62	1,745
Le Roi	659	19,235
Neepawa	14	14
Whitewater	42	63
Madison	3	3
Emerald	45	2,095
Arlington (Erie)	28	237
Rambler-Cariboo	30	1,688
Molly Gibson (Coryell)	22	22
Other mines	....	38,704
Total	4,943	320,866

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	9,442	599,855

SHARE MARKET.

(Courtesy of E. D. Warren & Co.)

COBALT STOCKS.

	January 6th, 1912. Bid.	Asked.
Bailey	.02	.02½
Beaver Consolidated	.41½	.42½
Buffalo	1.35	1.60
Chambers-Ferland	.10	.11
Cobalt Lake	.28¾	.29
Coniagas	6.80	7.10
Crown Reserve	2.85	2.95
Great Northern	.10¼	.10¾
Kerr Lake	2.60	2.90
La Rose	3.72	3.83
McKinley	1.64	1.67
Nipissing	6.55	6.65
Peterson Lake	.07	.08
Right of Way	.06¼	.06½
Temiskaming	.30	.32
Trethewey	.60	.75
Wettlaufer	.79	.84
Little Nip.	.01	.01½
Green Meehan	.01¾ Bid	
Silver Leaf	.03	.03½

PORCUPINE STOCKS.

American Gold	1.18	118½
Apex	.10½	.11½
Monita	.12	.16
Dobie	.50	1.05
Dome Extension	.54	.54½
Foley-O'Brien	.35	.40
Rea	1.80	1.84
Hollinger	13.67	13.75
North. Exploration	1.62½ Bid	
Pearl Lake	.37	.43
Central	3.40	3.60
Imperial	.07	.07½
Northern	.73	.74
Tisdale	Off	.03½
Preston East Dome	.11	.11½
Standard	Off	.20
Swastika	.21½	.22
Porcupine Gold	.57	.57½
United	.03	.03½
West Dome	.60	.90
Crown Chartered	.50	.52
Gold Reef	.10	.14
Porcupine Canada	.85	1.00
Achilles	.33¾	.34
Jupiter	.52	.53
Porcupine South	.61	.62

TORONTO MARKETS.

Jan. 6.—Quotations from Canada Metal Co., Toronto)—
Spelter, 6.75 cents per lb.
Lead, 4.35 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.50 cents per lb.
Electrolytic, 14.50 cents per lb.
Ingot brass, 7 to 12 cents per lb.

Jan. 6.—Pig Iron.—(Quotations from Drummond, McCall & Co., Toronto.)
Sumerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $18.50 (f.o.b. Toronto).
Midland No. 2, $18.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.
Coal, anthracite, $5.50 to $6.75.

Coke.

Jan. 4.—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $1.70 to $1.75 per ton.
Foundry coke, prompt, $1.90 to $2.00 per ton.

Jan. 4.—Tin, straits, 42.60 cents.
Copper, Prime Lake, 14.20 cents.
Electrolytic copper, 14.20 cents.
Copper wire, 15.25 cents.
Spelter, 6.45 cents.
Lead, 4.45 to 4.50 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 7.87½ cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $43.00 per 75-lb. flask.

U.S. PIG IRON OUTPUT

Bradstreets estimates the United States pig iron production for the year at 24,000,000 tons, a decrease of 12 per cent.

COBALT'S OUTPUT FOR 1911

The estimate is made, based upon preliminary figures that the silver output from the Cobalt camp for the year will be approximately 32,000,000 ounces, which if realized, means that this year will be a record-breaking one, exceeding that of 1910 by more than 2,000,000 ounces. The heavier tonnage is traceable to the increased tonnage of low grade ore treated.

Cobalt in its eight years of life has made a wonderful record report as a silver producer; having turned out approximately 125,000,000 ounces of white metal, with a gross value of nearly $65,000,000. The annual production in ounces with value per ton has been as follows:—

	Ounces	Value
1904	206,875	$111,887
1905	2,451,356	1,360,503
1906	5,401,766	3,667,551
1907	10,023,341	6,155,341
1908	19,437,875	9,133,378
1909	25,897,825	12,461,576
1910	29,856,069	15,375,000
*1911	32,000,000	16,000,000
	125,275,077	$64,265,236

COBALT RETURNS.

The silver production of Cobalt in the year 1911 will establish a new record production for the great Ontario silver mining district. The actual tonnage shipped as shown in the table published elsewhere in these columns, amounts to only 25,763 tons, and as such falls materially below the figures for the year 1910, when actual shipments of 33,977 tons were made. The discrepancy is due to the fact that in 1911 many of the mines confined their shipments of ore to concentrates, and as such the indicated value of the output will show up much larger in comparison than the published figures show.

It is also to be considered that Cobalt has made heavy shipments of silver bullion during the year, these amounting in all to a valuation of $1,678,353. This amount is to be added to the total production represented in the ordinary ore shipments, and will bring the aggregate considerably above the record for 1910.

It is too early as yet to form any accurate idea of the total value of the Cobalt production for the year, but it has been conservatively estimated that it will run into something like $16,500,000, an increase of a million dollars over 1910, when the output was valued officially at $15,477,986.

The shipments of bullion from the Cobalt camp for 1911 were as follows:—

Nipissing	1,751,187	$987,224
Nova Scotia	517,296	261,300
O'Brien	234,699	166,484
Crown Reserve	307,023	158,237
Timiskaming	85,282	42,502
Buffalo	71,845	39,283
Kerr Lake	13,740	6,266
Hudson Bay	10,292	4,369
Hargraves	5,023	2,776
Trethewey	3,518	1,680
Drummond	3,148	1,689
Cobalt Townsite	1,947	952
Silver Cliff	1,032	453
Colonial	468	257
Wettlaufer	330	160
Waldman	328	140
Unclassified	9,770	4,373
Total		$1,678,353

NOVA SCOTIA STEEL AND COAL CO.

The 1911 and 1910 outputs of the Nova Scotia Steel and Coal Co., are as follows:

	1910	1911
Coke made	90,360	97,971
Pig iron made	66,000	84,166
Steel ingots	31,521	84,503
Billets cogged	59,000	78,389
Shipments of finished materials, steel bars, ingots, plates, and forgings	60,200	69,800

As showing the extension of the company's business during the past seven years, the following output figures for 1903 and 1911 are interesting:—

	1903	1911
Pig iron	27,490	84,166
Steel ingots	31,521	84,503
Finished steel bars, plates and forgings	27,631	69,800

Mr. Thos. Cantley, general manager, stated recently that notwithstanding the depression which shadowed the trade during the year, considerable progress was made by the Scotia Company, and substantial increases shown in all its manufacturing departments.

Iron ore mining at Wabana passed through a period of transition during the year due to the substitution of submarine for surface mining, and while the tonnage exceeded that of 1910 these altering conditions prevented increase in output proportionate to the annual gain usually shown in this department.

In coal mining, a serious accident in the largest producing mine of the company early in January caused a heavy falling off in the output for the first quarter of the year. This mine has now, however, been working up to its full output for some months and while the output from all five collieries for the last quarter of the year exceeded the figures for the corresponding period of the previous year, the initial setback was not entirely overcome.

Very satisfactory increases were recorded in the metallurgical operations of the company.

COBALT ORE SHIPMENTS

Following are the shipments from the Cobalt camp for the week ending Dec. 29, and those from Jan. 1, 1911, to date:—

	Dec. 29. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger	.....	55,200
Bailey	.....	40,000
Beaver	.....	1,585,297
Buffalo	62,200	2,570,467
Casey Cobalt	.....	261,265
Chambers-Ferland	.....	1,364,900
City of Cobalt	.....	727,180
Cobalt Lake	126,640	4,162,900
Colonial	.....	227,910
Cobalt Townsite	59,000	1,388,053
Coniagas	.....	3,971,305
Crown Reserve	41,116	2,133,145
Drummond	.....	1,440,000
Green-Meehan	62,170	207,970
Hargraves	.....	204.880
Hudson Bay	.....	1,576,279
Kerr Lake	.....	2,520,190
King Edward	.....	40,000
La Rose	216,109	7,292,706
McKinley - Dar	148,161	6,491,736
Nipissing	130,964	6,032,281
O'Brien	.....	1,388,788
Little Nip	.....	58,430
Powerful	.....	2,010
Provincial	.....	202,050
Right-of-Way	.....	1,336,035
Silver Alliance	3,484	3.484
Silver Cliff	.....	106,680
Standard	.....	102,813
Temiskaming	62,540	1,748,641
Trethewey	58,620	1,330,746
Wettlaufer	.....	851,860

The shipments for the week were 1,071,004 pounds, or 535 tons, against 359 tons the previous week.

The shipments from Jan. 1 to Dec. 29 were 51,526,061 lbs. or 25,763 tons.

SILVER PRICES.

	New York. cents.	London. pence.
Dec. 26	54½	..
" 27	54⅜	..
" 28	54⅜	25⅛
" 29	54⅜	25⅛
" 30	54¼	25 1/16
Jan. 2	54⅝	25 3/16
" 3	54¾	25¼
" 4	54⅞	25 5/16
" 5	55	25¾

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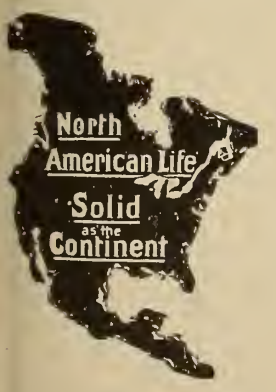

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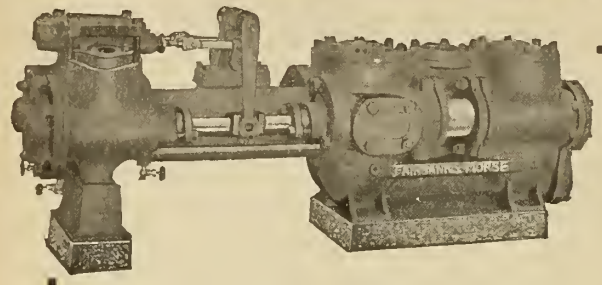

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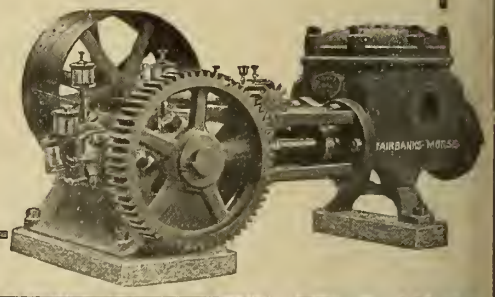

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

1064. Geology of an area adjoining the east side of Lake Timiskaming, by Morley E. Wilson.

ONTARIO.

1137. Memoir No. 10. An instrumental survey of the shore-lines of the extinct lakes Algonquin and Nipissing in South-western Ontario, by J. W. Goldthwaite.

NORTH WEST PROVINCES.

1115. Memoir No. 8. The Edmonton Coal Field, Alberta, with maps, by D. B. Dowling.

BRITISH COLUMBIA

1139. Memoir 11-T. Triangulation and Spirit Levelling of Vancouver Island, 1909, by R. H. Chapman.

YUKON and NORTH WEST TERRITORIES

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

1130. Memoir No. 9. Bighorn Coal Basin, Alberta, by G. S. Malloch, accompanied by a map.

MAPS RECENTLY ISSUED:

CANADA

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

1084. Geological Map of Canada. Scale 100 miles to 1 inch.

NOVA SCOTIA.

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1155. Map 24A. Millstream Iron Deposit, Gloucester County, N.B., geological and topographical. Scale 400 ft. to 1 inch.

1156. Map 25A. Nipissiguit Iron Deposit, Gloucester County, N.B., geology and topography, scale 400 feet to 1 inch.

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1066. Map 18A. Lake Timiskaming Mining Region. Scale 1 mile to 1 inch.

1112. Map 12A. Vicinity of the Transcontinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.

1180. Map 34A. Vicinity of the National Transcontinental Railway between the counties of Levis and Temiscouata, Quebec. Scale 8 miles to 1 inch.

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1091. Map 8A. Lake Nipigon, Thunder Bay District, Ontario. Scale 4 miles to 1 inch.

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1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

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791. West Kootenay sheet, B.C. Economic Minerals and Glacial Striae. Scale 4 miles to 1 inch.

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.

1198. Map 48A. Tulameen Coal Area, Yale District, B.C. Scale ½-mile to 1 inch.

1135. Map 15A. Phoenix, British Columbia, topographical. Scale 400 ft. to 1 inch.

1148. Map 20A. Victoria sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

1149. Map 21A. Saanich sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $71,213,103; Lode Gold, $60,811,067; Silver, $31,095,602; Lead, $24,645,605; Copper, $60,743,405; Other Metals (Iron, Zinc, etc.), $1,083,172; Coal and Coke, $114,012,596; Building Stone, Brick, etc., $10,593,100; making its Mineral Production at the end of 1910 show an

Aggregate Value of $374,197,650

In 1910 the quantity of Ore mined was 2,216,428 tons, and of coal 3,139,235 long tons. The value of Minerals produced that year was: Placer Gold, $540,000; Lode Gold, $5,533,386; Silver, $1,245,016; Lead, $1,386,350; Copper, $4,871,512; Coal and Coke, $11,108,335; Other Minerals, $1,692,473, making the

Total Value for 1910, $26,377,066

Lode-mining has only been in progress for about eighteen years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

Mineral Locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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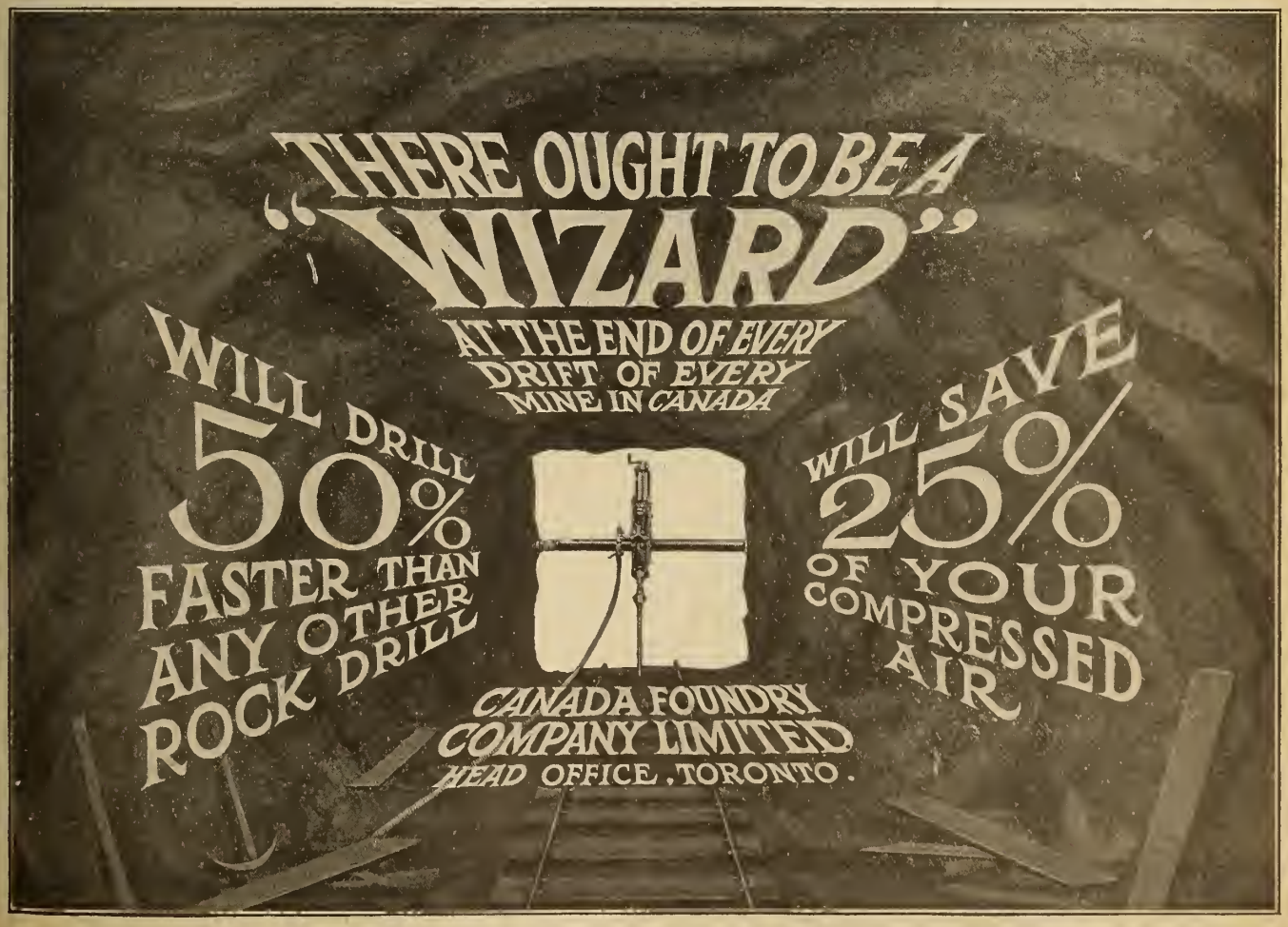
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PROVINCE OF QUEBEC

Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. W. H. HEARST,

Minister of Lands, Forests and Mines,

Toronto, Canada.

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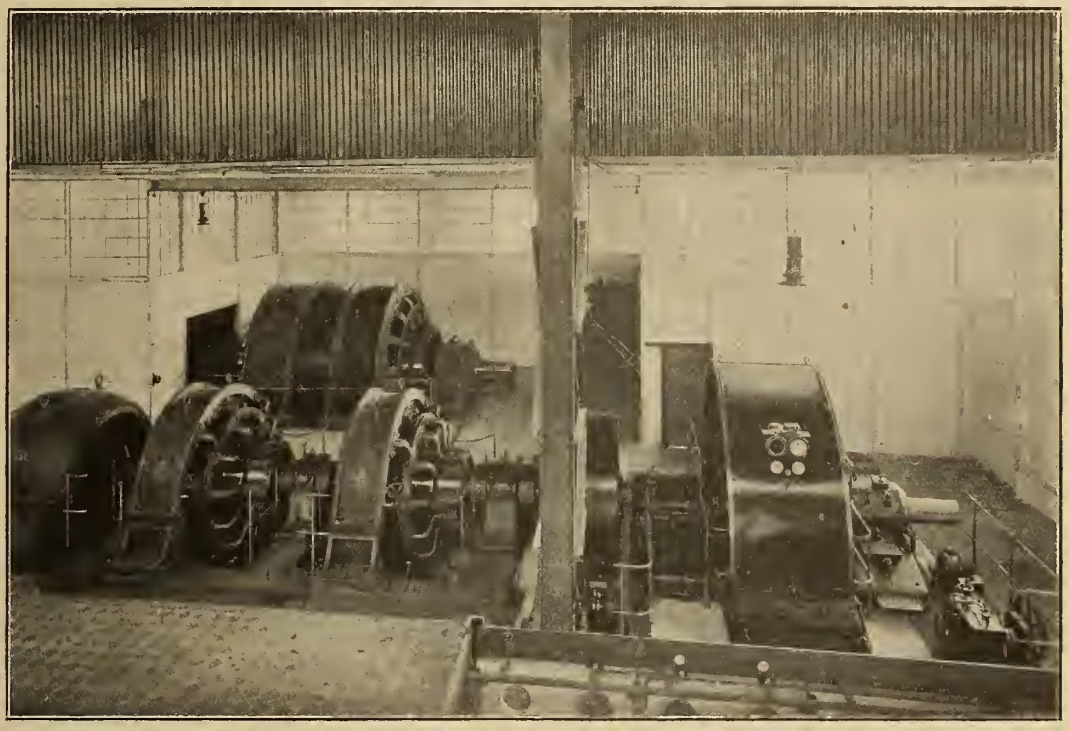

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Canadian Fairbanks Co., Ltd.

Hoisting Machinery—
Allis-Chalmers-Bullock.
Canadian Fairbanks Co., Ltd.
Canadian Rand, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co., Ltd.
Link-Belt Co.
Mussens, Ltd,
M. Beatty & Sons.
Peacock Bros.
Sullivan Machinery Co.
S. Flory Mfg. Co.
Waterous Engine Works.
E. Leonard and Sons.

Hoisting Machinery (Gasoline)—
The Canada Producer & Gas Engine Co.

Jacks—
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.

Jigs—
Allis-Chalmers-Bullock.
Jenckes Machine Co., Ltd.

Lamps (Mine Safety)—
Ackroyd & Best, Ltd.
Peacock Brothers.

Locomotives—
Jeffrey Mfg. Co.
Canadian Westinghouse Co.

Link Belt—
Link-Belt Co.
Waterous Engine Works.
Jones & Glassco.

Metal Merchants—
Henry Bath & Son
Geo. G. Blackwell, Sons & Co.
The Consolidated Mining & Smelting Co. of Canada, Ltd.
Nipissing Reduction Co.
Canada Metal Co.

Mica Dealers—
Henry Bath & Son.
Geo. G. Blackwell, Sons & Co.

Mining Supplies & Outfits—
Allis-Chalmers-Bullock.
Alex. Fleck, Limited.
Jenckes Machine Co., Ltd.
Mussens, Ltd.
Peacock Bros.
John McDougall Caledonian Iron Works.
Cochrans Hardwars, Ltd.

Nickel—
Canadian Copper Co.

Nissen Stamps—
Canadian Fairbanks Co., Ltd.

Ore Sacks—
Canadian Bag Co.
Canadian Fairbanks Co., Ltd.

Pneumatic Tools—
Peacock Bros.
Canadian Rand Co., Ltd.

Perforated Metal—
B. Greening Wire Co.

Picks—
Mussens, Ltd.
Peacock Brothers.
Thomas and William Smith.

Prospecting Mills & Machinery—
Standard Diamond Drill Co.
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.
American Diamond Rock Drill.

Puisometers—
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.

Pulverizer—
Northern Foundry & Machine Co.

Pumps (Mining)—
Allis-Chalmers-Bullock.
M. Beatty & Sons, Ltd.
Canadian Rand Drill, Ltd.
Alex. Fleck, Limited.
E. Leonard and Sons.
Peacock Brothers.
Smart & Turner Machine Co.
Thomas and William Smith.

Pipe (Riveted)
E. Leonard and Sons.
Jeffrey Mfg. Co.
John McDougall Caledonia Iron Works
Peacock Bros.
Smart-Turner Machine Co., Ltd
Mussens, Ltd.
Peacock Bros.
Canadian Fairbanks Co, Ltd.

Retorts
E. Leonard and Sons.

Roofing, Steel—
Dominion Bridge Co.
Paterson Mfg, Co.

Rock Drills—
Canadian Cleveland Drill Co.
Mussens, Ltd.
Peacock Brothers.
Canadian Rand, Ltd.

Rope Drives—
Link-Belt Co.
Waterous Engine Works.
Jones & Glassco.
John McDougall Caledonian Iron Works Co., Ltd.

Rails (Steel)—
Montreal Steel Works, Ltd.
Mussens, Ltd.

Rope (Wire, Manila, Cotton)—
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Allis-Chalmers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Roasting Plants—
Allis-Chalmers-Bullock.

Scales—
Canadian Fairbanks Co., Ltd.
Peacock Brothers.
Thomas and William Smith.

Screens—
B. Greening Wire Co,
Allis-Chalmers-Bullock.
Jenckes Machine Co., Ltd.
Jeffrey Mfg. Co.
Peacock Bros.
Link-Belt Co.
Waterous Engine Works.

Shafting—
John McDougall Caledonian Iron Works Co., Ltd.
Canadian Fairbanks Co., Ltd.
Smart-Turner Machine Co., Ltd.

Slime Tables—
James Orr Concentrator Co.
Deister Concentrator Co.

Smelting Machinery—
Allis-Chalmers-Bullock.
Mussens, Ltd.
Peacock Bros.

Springs—
Montreal Steel Works, Ltd,

Stamp Mills—
Allis-Chalmers-Bullock.
Peacock Bros.
Jenckes Machine Co.
Mussens, Ltd.
Canadian Fairbanks Co., Ltd.

Steel Kegs (Beath's)—
W. D. Beath & Son, Ltd.

Structural Metal Work—
Dominion Bridge Co.

Surveying Instruments—
Eugene Dietzgen Co., Ltd.
Stanley, W. F.
C. L. Berger & Sons.
John Davis & Son.
Peacock Bros,
Mines Chemical Supply Co.

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Peacock Bros.
Hadfield's Steel Foundry Co.
Montreal Steel Works, Ltd.

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Mussens, Ltd.
Thomas and William Smith.
Canadian Fairbanks Co., Ltd.
Edgar Allen & Co., Ltd.
Nova Scotia Steel & Coal Co.

Tramways—
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Mussens, Ltd.

Turbines—
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Laurie & Lamb.

Tube Mills—
Allis-Chalmers-Bullock.
Peacock Bros.

Winding Engines—
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works.
Mussens, Ltd.
M. Beatty & Sons.
E. Leonard and Sons.

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Allan, Whyte & Co.
Allis-Chalmers-Bullock.
B. Greening Wire Co.
Jeffrey Mfg. Co.
Mussens, Ltd.
Peacock Bros,

Water Wheels & Tanks—
John McDougall Caledonia Iron Works.
Jenckes Machine Co.

Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.
Main Western Office - VICTORIA, B.C.

SUCCESSORS TO

Hamilton Powder Co. Ontario Powder Co.
Standard Explosives Ltd. Acadia Powder Co.
Western Explosives Ltd.

MANUFACTURERS OF ALL GRADES OF

High Explosives, Gelatinized Explosives, Stumping Powders, Black Blasting and Sporting Powders, etc., etc.
Safety Fuse, Electric Fuses, Batteries, and all Blasting Accessories

Licensed by Nobels Explosives Co., Ltd., Glasgow, to Manufacture for Canada

Nobel Monobel (Patented) and Samsonite

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Halifax, N.S. Toronto, Ont. Cobalt, Ont. South Porcupine, Ont. Sudbury, Ont.
Sault Ste. Marie, Ont. Port Arthur, Ont. Kenora, Ont. Winnipeg, Man. Nelson, B.C.
Vancouver, B.C. Prince Rupert, B.C.

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Beloeil Station, P.Q. Windsor Mills, P.Q. Vaudreuil, P.Q. Nanaimo, B.C.
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To Europe in
Less than Four Days

LAND TO LAND

The St. Lawrence Route to Europe by the ROYAL LINE shortens the ocean voyage to less than four days, and affords the traveller two days of delightful, sheltered sailing down the great St. Lawrence with its never ending panorama of beautiful scenery and historically famous points. The splendid triple turbine steamers

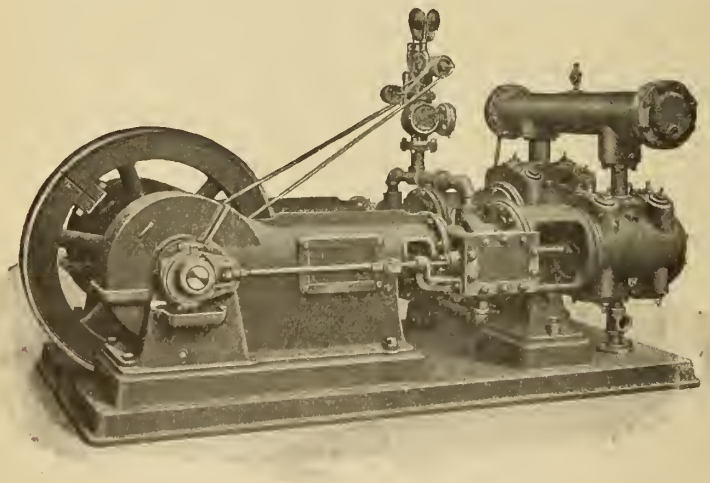
ROYAL GEORGE and ROYAL EDWARD

hold all speed records and afford the most luxurious accommodation in the Canadian-European service. The English Port, Bristol, is only two hours' run to London by the special boat trains which meet the Royal Line Steamers on arrival.
For further information see nearest Steamship Agent, or the Canadian Northern Steamships, Limited.

GUY TOMBS, . . General Agent, Canadian Northern Steamships, Montreal, Que.
P. MOONEY, . . . " " " " " Halifax, N.S.
H. C. BOURLIER, . . " " " " " Toronto, Ont.
A. H. DAVIS, . . . " " " " " Winnipeg, Man.

LAIDLAW-DUNN-GORDON AND CLAYTON

AIR COMPRESSORS



DUPLEX TWO STAGE ENCLOSED FORKFRAME

Extract from Letter Dated
Nov. 29, 1911.

"I have one of the Laidlaw-Dunn-Gordon Air Compressors, manufactured by the Clayton Works, which is giving the best of satisfaction. I consider it one of the finest makes of air compressors on the market."

Signed

Name of Mining Company and Engineer furnished on application.

WRITE FOR CATALOGUE J.C. 204

MUSSENS LIMITED

CANADIAN SALES AGENTS

MONTREAL TORONTO COBALT WINNIPEG VANCOUVER CALGARY

Canadian Steel Foundries, Ltd.

Successors to

MONTREAL STEEL WORKS, LIMITED and ONTARIO IRON AND STEEL Co'y, of Welland, Ont.

P.O. BOX 1630 MONTREAL

MANUFACTURERS OF

Steel Castings
(Acid and Basic open Hearth System)

Switches and Track Work
for Steam and Electric Roads

Springs
of all kinds

Maganese Steel Castings
for wearing Parts, insuring Great Hardness and Durability

INTERLOCKING PLANTS
TRUCKS FOR ELECTRIC CARS

Manufacturers of Bar Steel and Angles, and the following types of Couplers, Sharon, Tower, Climax, Latrobe, Melrose, Chicago, R.E. Janney and Simplex.

AGENTS FOR CANADA FOR

BARROW HAEMATITE STEEL CO., - - Barrow-in-Furness, England

Quotations for Tee Rails, Fish Plates, etc., promptly furnished. Catalogues sent on application.

"FOREST, STREAM AND SEA-SHORE"

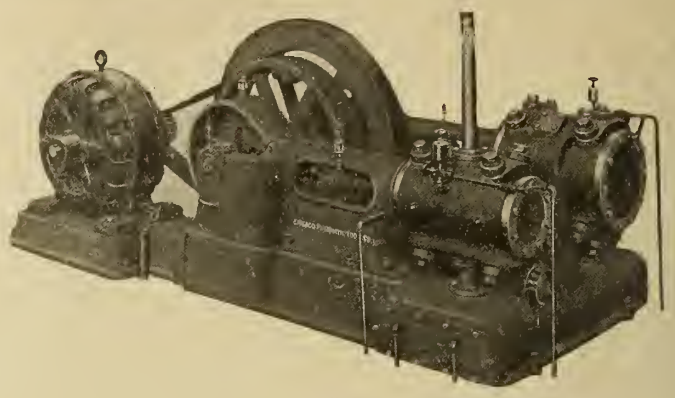
A book of over 200 pages, illustrated in colors and in half-tone, giving well-written description of the country contiguous to the line of railway, replete with historic incident, legend and folk-lore, worthy a place in any library. Send ten cents in stamps to

General Passenger Department, Intercolonial Railway

MONCTON, N. B.

Operate your small tools, drills, coal cutters, etc., with

Westinghouse Motor-Driven Air Compressors



Westinghouse Induction Motor Driving Air Compressor

placed conveniently near the point of application of the air and thus avoid long and complicated systems of piping, necessary with steam-driven units.

Westinghouse Motor-Driven Air Compressors are in every way more economical and eliminate all of the many objections to steam driven compressors.

Canadian Westinghouse Co., Ltd., Hamilton, Ont.

TORONTO	MONTREAL	HALIFAX	WINNIPEG	CALGARY	VANCOUVER
Traders Bank Bldg.	52 Victoria Square	Telephone Bldg.	158 Portage Ave. East	311 8th Ave. W.	Bank of Ottawa Bldg.

ESTABLISHED 1838.

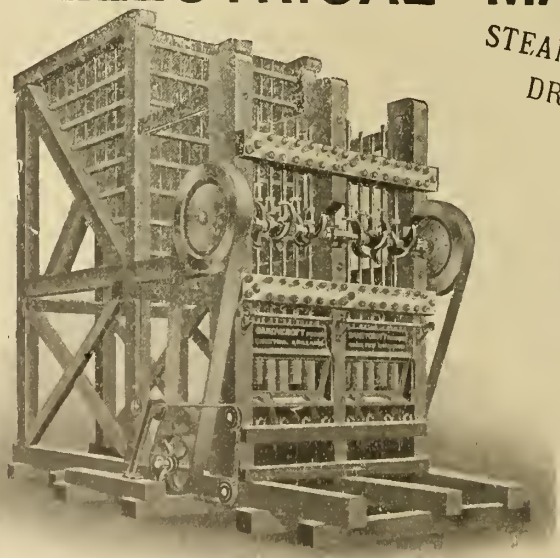
SANDYCROFT FOUNDRY CO., LD., CHESTER & LONDON.

MANUFACTURERS OF

MINING AND ELECTRICAL MACHINERY.

ORE DRESSING & CRUSHING MACHINERY.

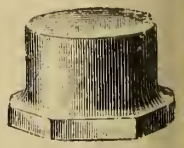
STEAM & ELECTRICALLY DRIVEN WINDING ENGINES.



STAMP MILLS.

SPECIAL GRADE OF FORGED STEEL SHOES.

SPECIAL GRADE OF FORGED STEEL DIES.



THOS. & WM. SMITH, LTD.,

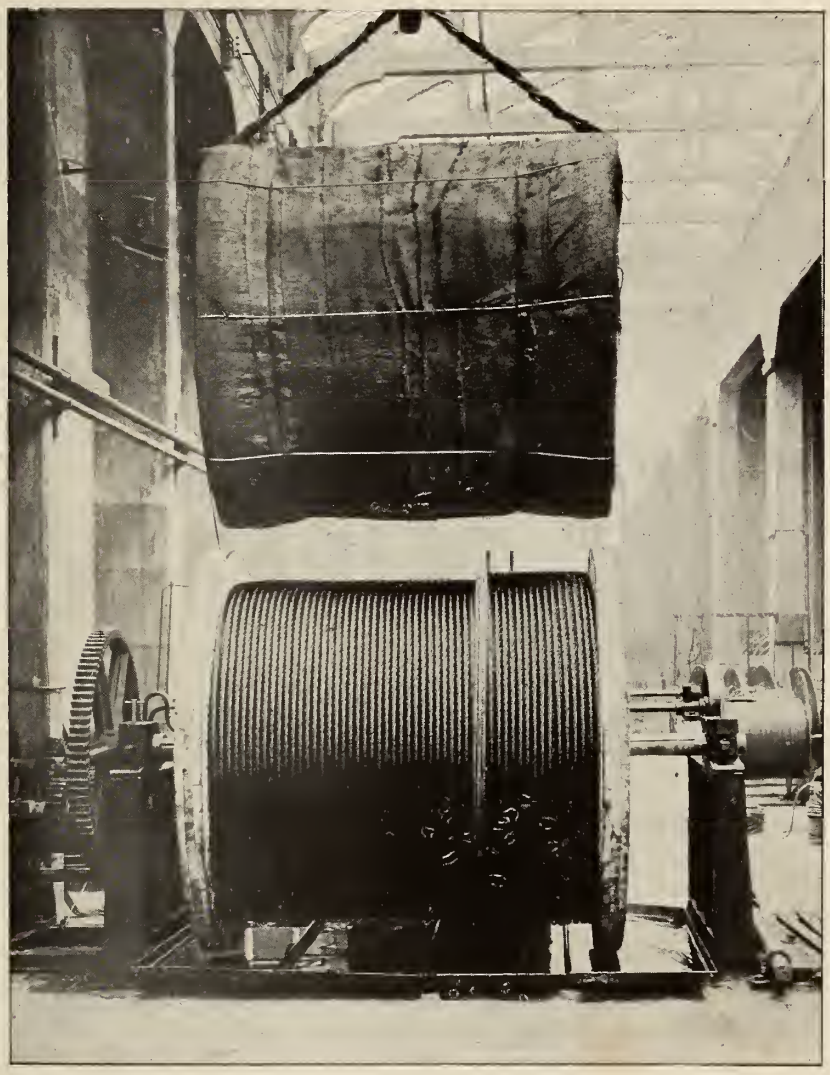
WIRE ROPE MANUFACTURERS,

NEWCASTLE-ON-TYNE, ENGLAND.

STEEL WIRE ROPES (RED THREAD BRAND.)

For **MINING:—**
Winding, Hauling, etc.

Also Aerial Cableways,
Cranes, Dredges, etc.



Two Reels of Wire Rope for a Colliery Company in Nova Scotia, each 10,000 feet long, 1⅛" diameter, and weighing ten tons each.

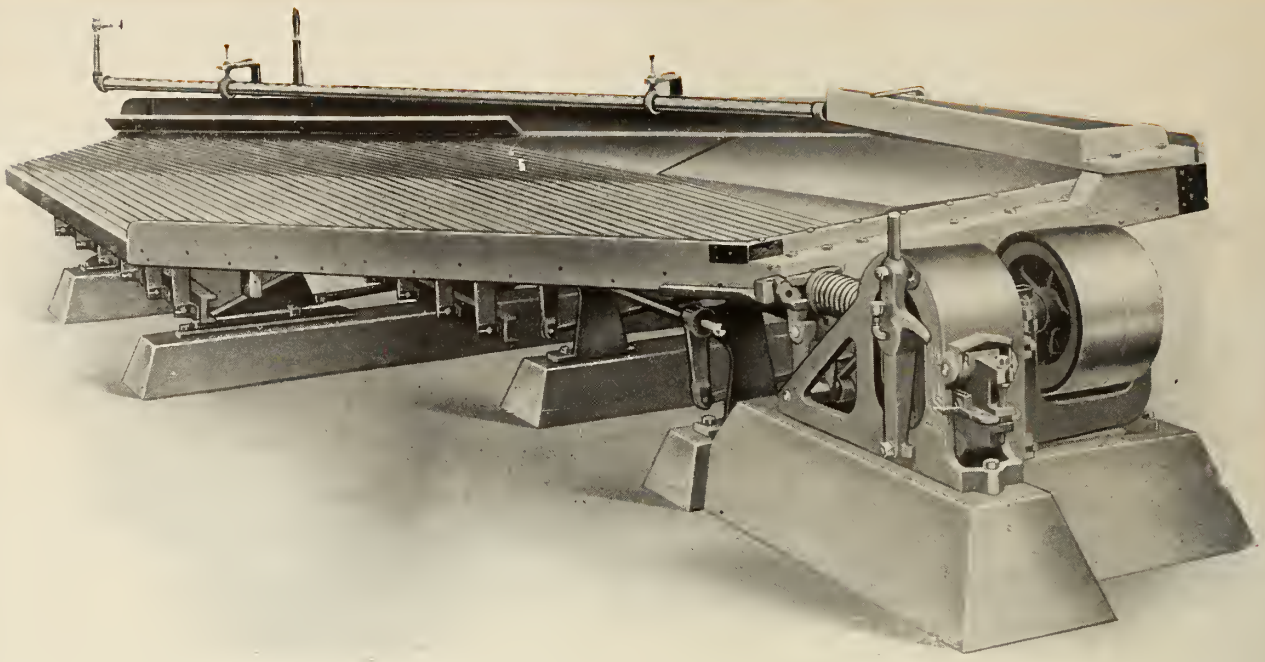
MODERN AND UP-TO-DATE APPLIANCES
for dealing rapidly and efficiently with Wire Ropes of any weight.

CANADIAN REPRESENTATIVE:

D. W. CLARK, P.O. Box 531, Montreal, P.Q., CANADA.

AGENTS:

EVANS, COLEMAN & EVANS, Ltd., Vancouver, B.C.
ANGEL ENGINEERING & SUPPLY CO. Ltd., St. John's, N.F.
DOMINION EQUIPMENT & SUPPLY CO., Winnipeg, Man.
BAINES & PECKOVER, Toronto, Ont.



The James Diagonal Plane Table has been proven to have superior quality over the all-riffle table, the difference being 20% better extraction in a 60 day competitive test in favor of the diagonal plane table working on fine table feed. This table is manufactured in New Glasgow, Nova Scotia, for the Canadian Market, and Newark, N.J., for the United States and Mexican Markets.

James Ore Concentrator Company, 35 Runyon St., Newark, N.J.

THE BEST IS CHEAPEST

CURTIS'S & HARVEY

(CANADA) LIMITED

Dynamite
Powder
Blasting
Supplies

CURTISS & HARVEY (CANADA) LIMITED
DRAGON BRAND

Full
Strength
Uniformity
Stability

BEST QUALITY ONLY

Explosives for Every Kind of Work

Factory, DRAGON STATION, P.Q.
NEAR MONTREAL

ADDRESS ALL CORRESPONDENCE TO

400, St. James St., MONTREAL
JAMES J. RILEY, Jr., General Manager.

Long Distance Telephone, Main 113
GEORGE RILEY, Sales Representative.

THE CANADIAN MINING JOURNAL

33 TORONTO No. 3

IF YOU FAILED to read this letter in the January 1st issue of this Journal, then you should READ IT NOW. If you did read it, then we think it is good enough to be read again.

(COPY)

MUSSENS LIMITED, ... Que.,
MONTREAL, QUE. November 4th, 1911

Gentlemen:—

It gives me great pleasure in saying that I consider the **Holman Steel Rock Drill** is in my opinion the best Rock Drill on the market.

I have used practically every make of Drill known in Canada and the United States, and find from the standpoint of Maintenance and Efficiency, none work out as well as the Holman.

I have, at this property, four 3¼ inch Holman Drills, two of which were bought in July, 1910, and two in January, 1911. The maintenance costs have been very low; the renewals or repairs to Cylinders, Pistons and Cradles, over the whole period have been nil. I find the power consumed in proportion to the work performed is moderate, and on ordinary pressures, the drilling speed is satisfactory.

I find your Drills most suitable for all round mining work, whether driving, stoping, sinking or raising.

You may make whatever use you like of this letter, as in my opinion, any mine which installs Holman Drills will benefit by the change.

(Name of Company and Name of Engineer furnished on application.)

Yours very truly,

_____

Superintendent Engineer.

We could fill pages of reading matter regarding records made by the Holman Steel Rock Drill: we could tell you that it is THIRTY or FORTY years ago since the first Holman Drill was turned out: we could say you buy drilling experience when purchasing Holman Drills for Holman Bros. are Drill Users as well as Drill makers, BUT WHAT'S THE USE for RESULTS ARE WHAT COUNT and we can show results.

WRITE NEAREST OFFICE FOR CATALOGUE J38.

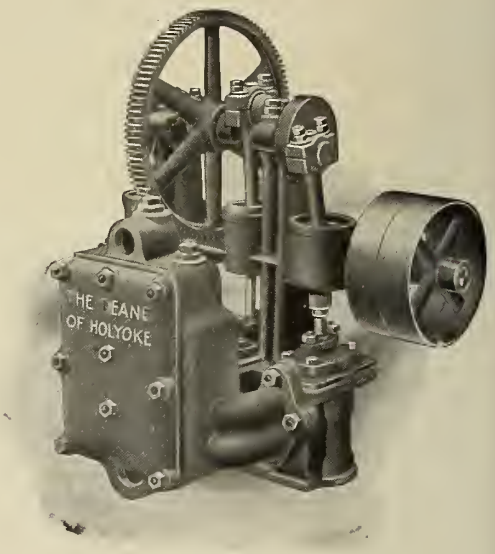
MUSSENS LIMITED

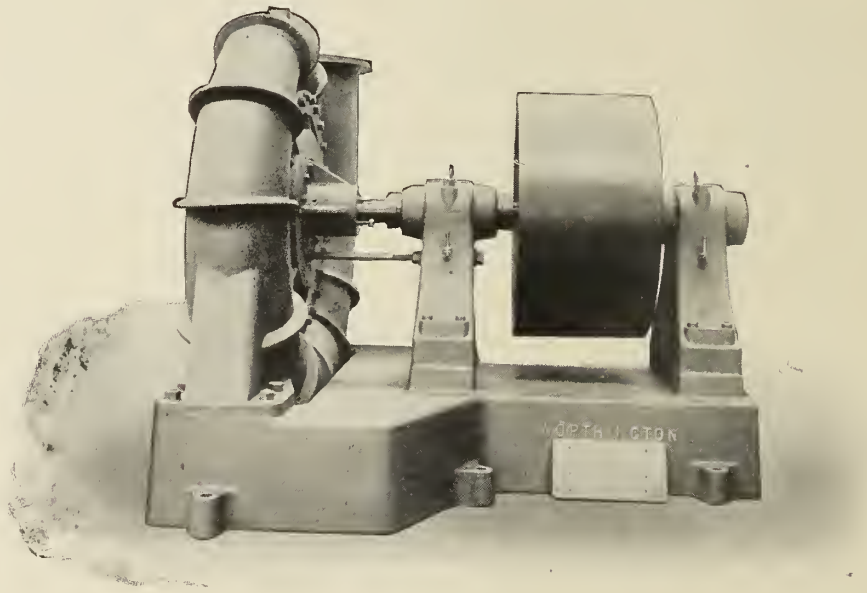
MONTREAL, 318 St. James St. **TORONTO,** 73 Victoria St. **COBALT,** opp. Right of Way Mine. **WINNIPEG,** 259-261 Stanley St. **CALGARY,** Samis Block **VANCOUVER,** 365 Water St.

PUMPING MACHINERY

OF ALL CAPACITIES FOR ALL PURPOSES

Reciprocating or Centrifugal





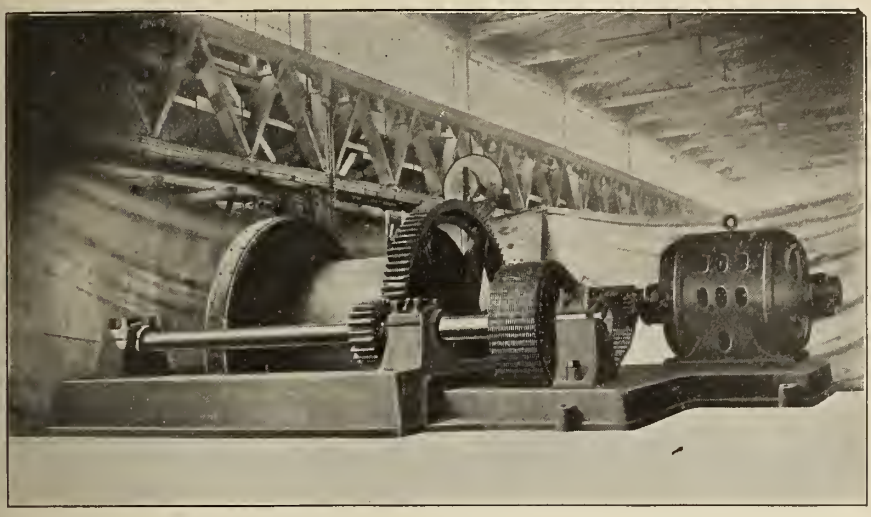
Works: 512 William Street, Montreal

The John McDougall Caledonian Iron Works Co.

LIMITED

Sales offices: Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.

Renold Patent Silent Chains



A Renold Silent Chain Driving a Mine Hoist from a 150 h.p. Motor.

INSURE AGAINST BREAKDOWNS.

transmit any power at a high speed quietly.

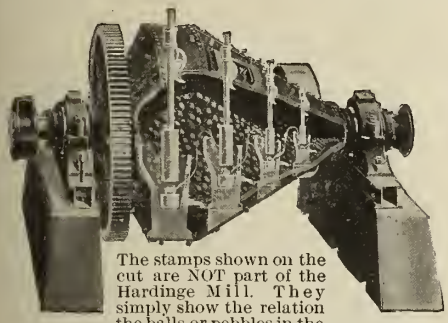
No Slipping, saves power continuously.

Runs either forward or backward, fast or slow, and is not affected by either heat, cold or moisture.

WRITE FOR CATALOGUE.

JONES & GLASSCO, Sole Canadian Agents

49 Place D'Youville, Montreal



The stamps shown on the cut are NOT part of the Hardinge Mill. They simply show the relation the balls or pebbles in the Hardinge Mill bear to a number of stamps arranged for **Ideal Stage Crushing.**

THE SCREENLESS PATENTED

HARDINGE MILLS

are built in various sizes for

GRINDING GOLD & SILVER ORE

GRANULAR
(For Concentration)

TO A SLIME
(For Cyanidation)

Note comparison between the modern and old methods of reduction wherein power is automatically adjusted to results.

We have a test mill in operation in New York with which we will be glad to prove all claims.

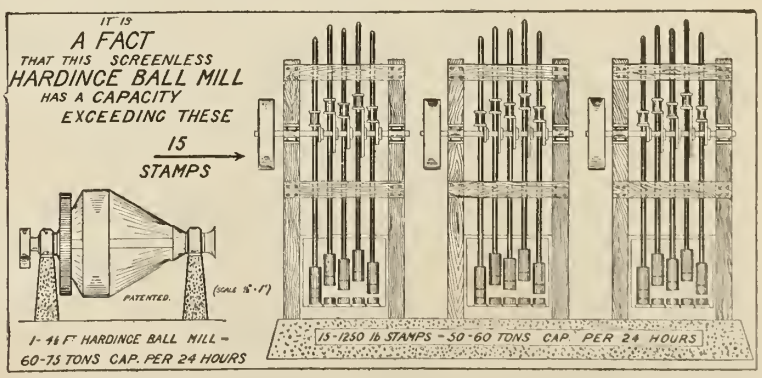
WRITE FOR LITERATURE.

HARDINGE CONICAL MILL COMPANY

50 Church Street, - NEW YORK

CABLE ADDRESS: "Halharding, N.Y."
CODE: "Bedford-McNeill."

PHIL. H. MOORE, Canada Foundry Co., Ltd. Toronto, Ont.



Save $73,000.00 in Cyanide and Dissolved Values

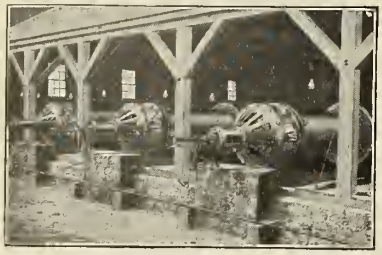
That is the record of four

BURT REVOLVING CYANIDE FILTERS

In operation ten months, filtering 385 tons dry weight of slime for twenty-four hours at a total cost per ton filtered of 6c.

The four filters and an 8½x10 Triplex Pump were driven by a 50 h.p. motor.

Life of filter cloths seven to eight months.



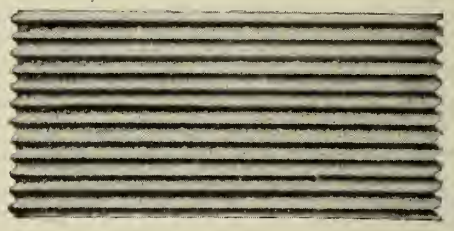
We also build
STAMPS,
TUBE MILLS
and
CRUSHERS

CHALMERS & WILLIAMS
CHICAGO HEIGHTS, Ill.

Corrugated Iron

BLACK, PAINTED OR GALVANIZED
Straight or Curved

Stock carried of all gauges, lengths up to 10 feet.



Ridges Flashings Cleats Bolts
and all other necessary sundries.

We Specialize on

Curved Sheets for Concrete Supports

The Metallic Roofing Co. Limited
MANUFACTURERS
TORONTO, ONT. WINNIPEG, MAN.
C45

Cores can be taken at any angle with

SULLIVAN DIAMOND DRILLS

Angle drilling is exceedingly valuable in mine exploration, underground, as well as in testing inclined strata from the surface.

This picture shows the adaptability of Sullivan Diamond Drills to difficult working conditions.

Do not forget that Diamond Drills are the **only ones** which can take a core at any angle of the 360. Sullivan Drills are made in a larger variety than any others.

CATALOGUE 655

Rock Drills **Air Compressors**
Coal Cutters **Hammer Drills**

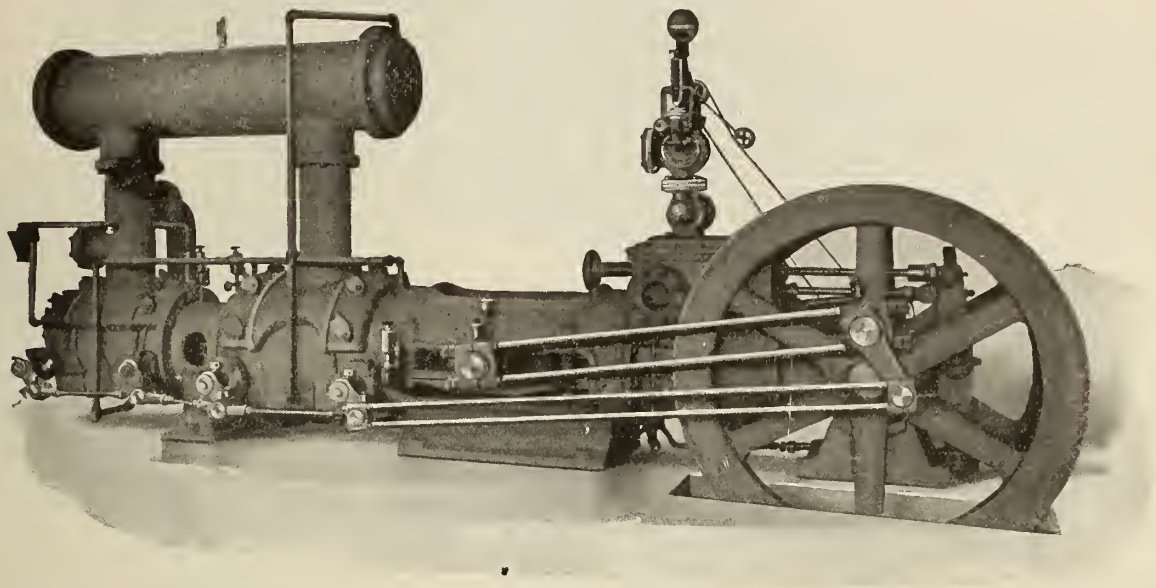
"E" Drill set up across Mexican "Arroyo." Hole 400 ft. deep: pitch 45°.

Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill.

Butte Birmingham, Ala. Boston Denver, Colo. El Paso Joplin, Mo. Knoxville London Nelson, B.C. New York Pittsburg Paris, France St. Louis San Francisco Salt Lake Seattle Spokane Sydney, N.S.W.

COMPOUND Air Cylinders should INTEREST

AIR COMPRESSOR PURCHASERS



For service where good attendants are hard to get or for semi-permanent duties, the compound straight line steam driven machine illustrated above embodies many highly desirable features.

Every feature of economy that characterizes our compound duplex Compressors is embodied in the air end of this straight line design.

This new machine is the embodiment of all the best known modern principles of air compression and shows efficiencies second to no other type.

Operating conditions such as fuel costs, attendance, etc., vary so much in different places that it is impossible to say what economies may be effected with any machine but the COMPOUND AIR CYLINDERS of this Rand Class "C-2" compressor mean 15% to 20% saving in power costs over single stage compression. This saving alone, based on the nominal figure of $50 per H.P. per year, means a total saving of $900 per year over single stage compression. Yet the first cost is but very little more than that of the single stage machine.

SOME FEATURES OF THIS DESIGN

The machine is provided with a combined speed and pressure governor. The speed governing element is driven by a belt while the pressure element is connected by a pipe to the air receiver. The design is such that the speed is always under the control of the air pressure thus maintaining steady air pressure and enabling the machine to run very slowly without stopping.

The steam cylinder embodies many advantages. The ports are short and direct and of large cross-section. The exhaust passage in particular is designed to reduce back pressure to the limit. The cylinder barrel and steam chest are protected against radiation by a sheet steel lagging.

The balanced steam valves are provided with special ports and are designed to automatically take up wear of all surfaces, insuring a permanent condition of tight valves and low friction. Adjustment of the cut-off may be made from one-third to three-quarters stroke, while the machine is in operation.

These and other advantages of this steam cylinder mechanism combine to make it very economical in steam consumption and most reliable in its simplicity.

The annual cost per foot of air is far more important than the first cost of an air compressor.

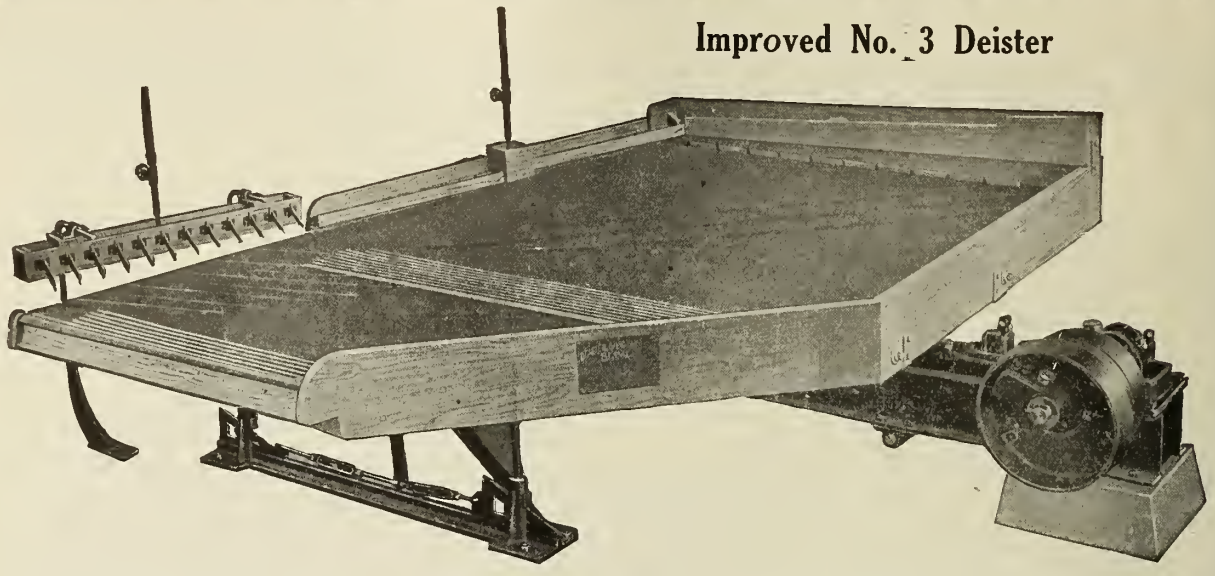
CANADIAN RAND COMPANY

LIMITED

Commercial Union Building, MONTREAL, CANADA

Toronto, Cobalt, South Porcupine, Winnipeg, Lethbridge Rossland Spokane, Vancouver, Sydney.

Improved No. 3 Deister



The Hollinger Gold Mines, Limited, new mill in the Porcupine district will be equipped with Improved No. 3 Deister Slime Tables.

Send all inquiries and orders for Deister Tables and Repair Parts to

E. DEISTER, Office 916 Calhoun St., FORT WAYNE, INDIANA, U.S.A.

Sole owner of Canadian Patent Rights for Deister Tables.

The Canadian Bank of Commerce

PAID-UP CAPITAL, $11,000,000

REST - - 9,000,000

DRAFTS ON FOREIGN COUNTRIES

Arrangements have recently been completed under which the branches of this Bank are able to issue **Drafts** on the principal points in the following countries.

Austria-Hungary	French Cochin-China	Norway
Belgium	Germany	Persia
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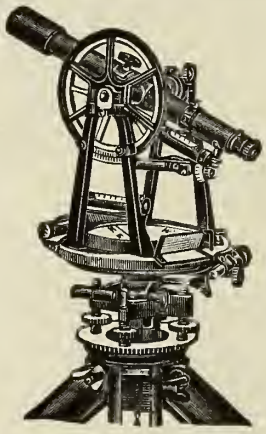

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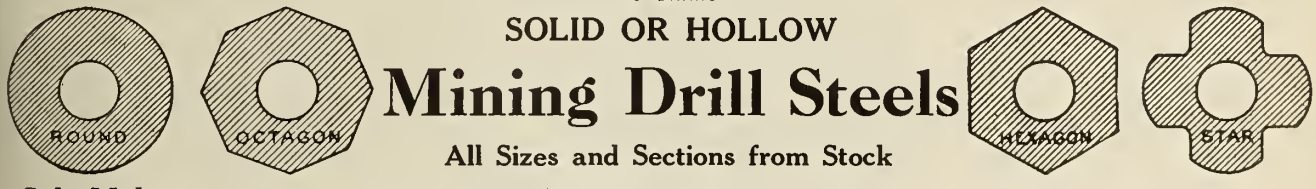

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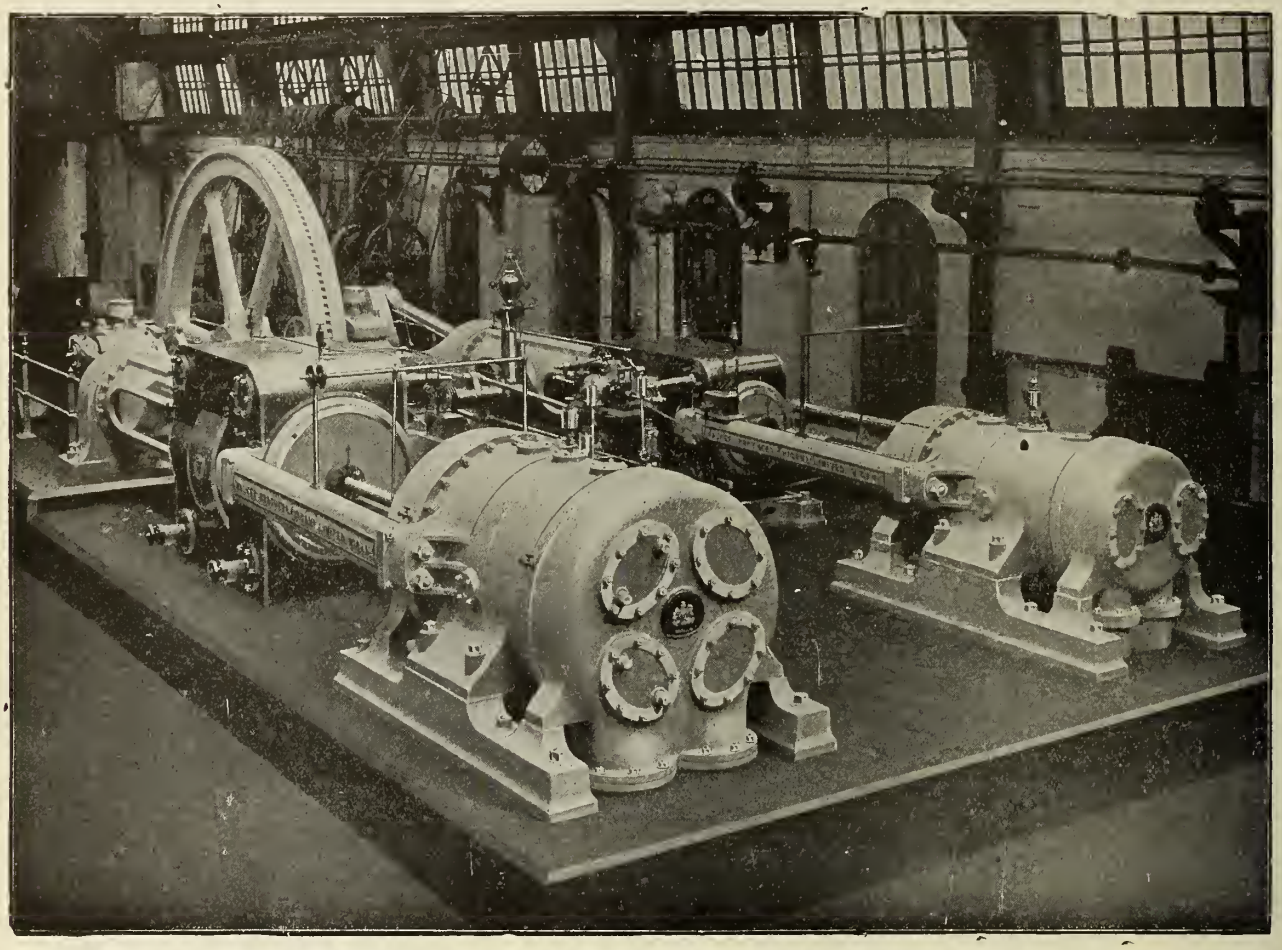

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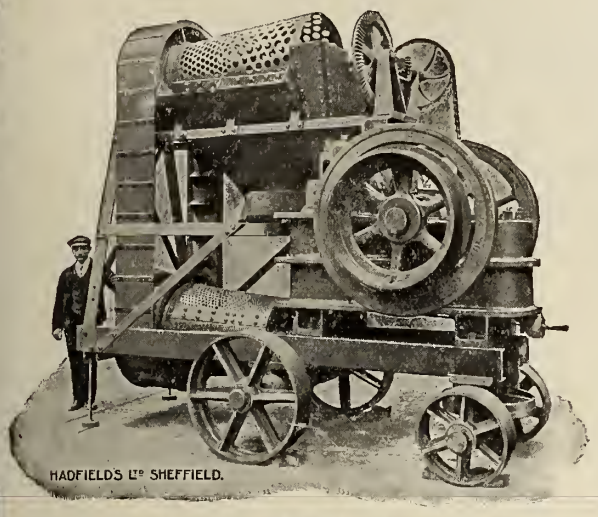

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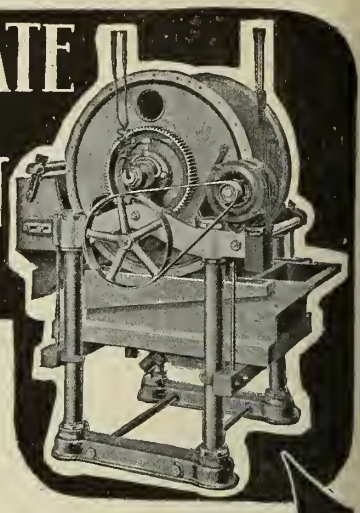

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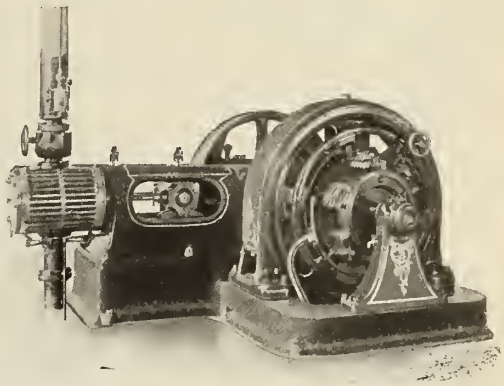

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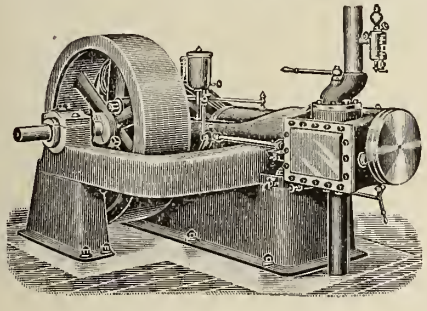

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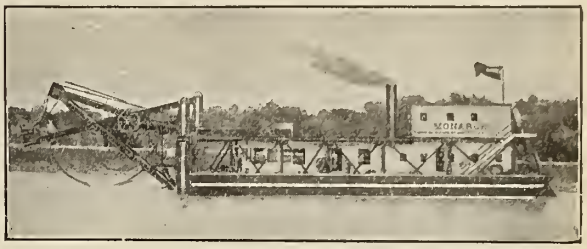

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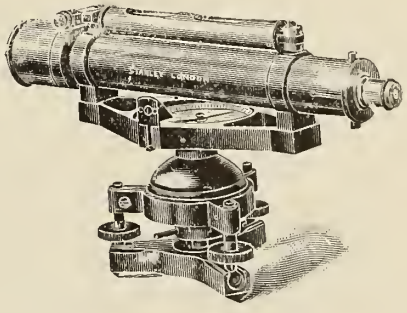

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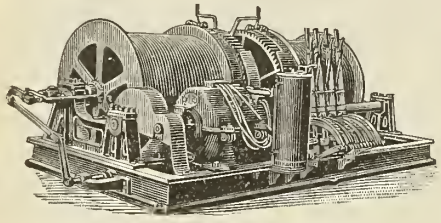

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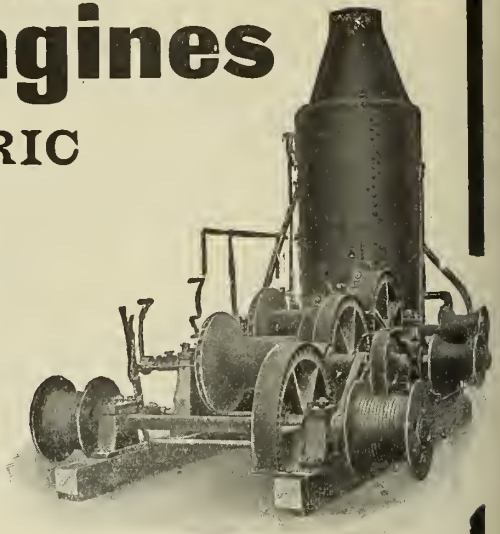

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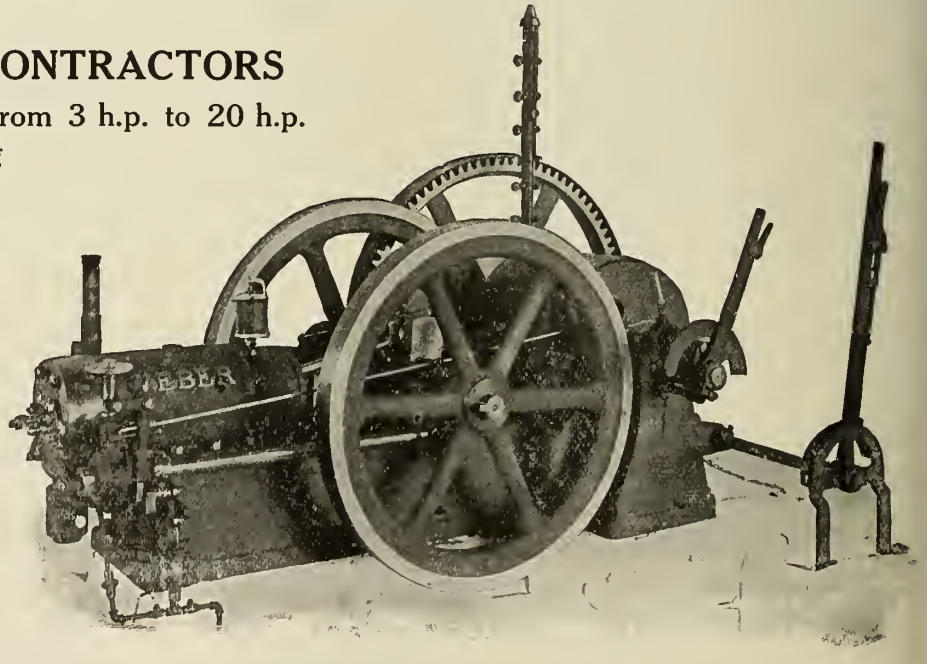

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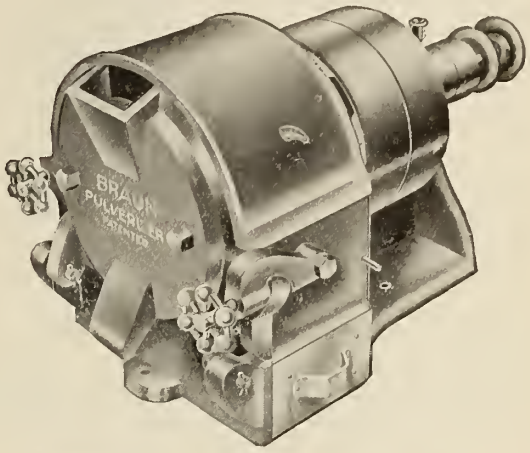

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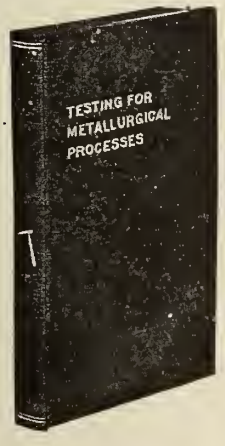

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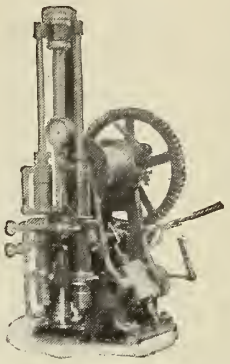

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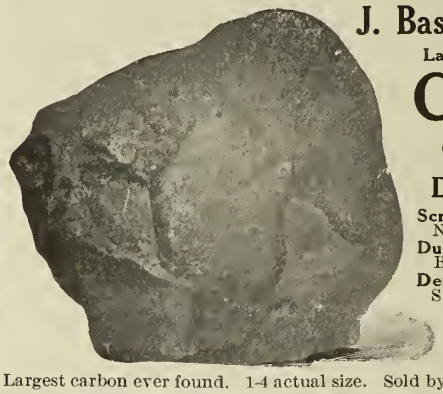

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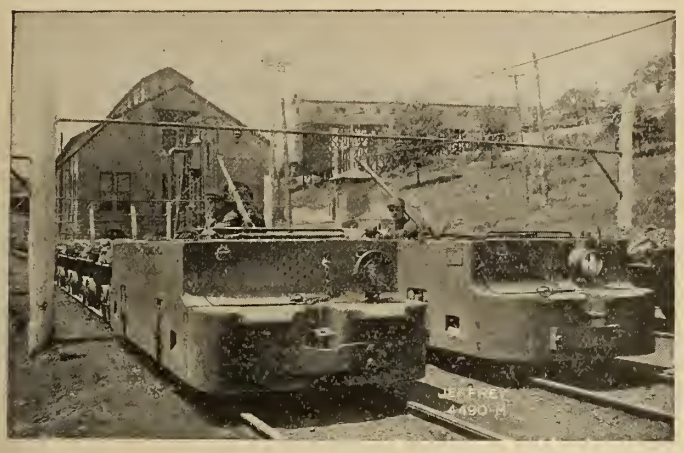

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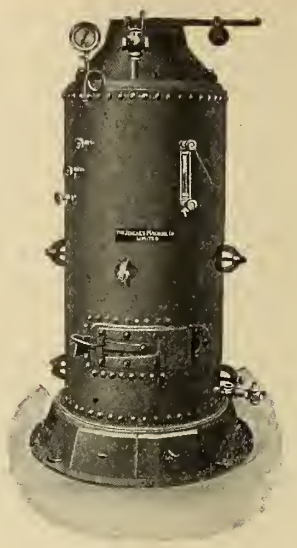

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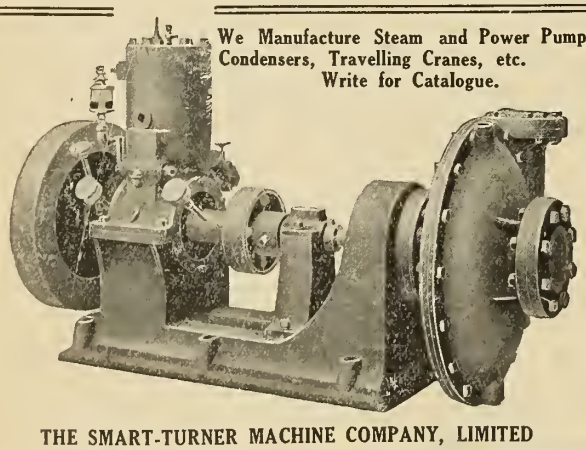

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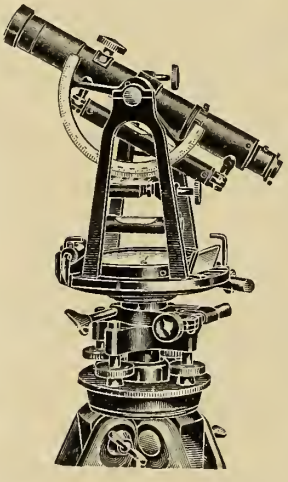

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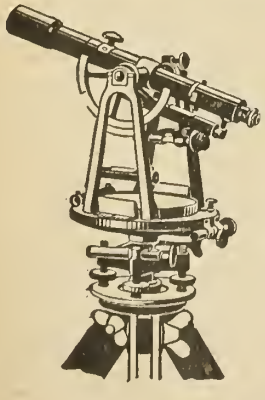

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THE CANADIAN MINING JOURNAL

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THE BOUNTY.

The bounty on Canadian iron and steel production has come once again into the realm of practical politics. So often has the vexed question of subsidizing the iron industry been argued that there is little profit in attempting to state both sides of the case. It may not be inappropriate, however, to glance rapidly over the arguments advanced by those who seek a renewal of the bounty.

At the time of the general revision of the tariff in 1897, the total protection, bounties and duties combined, amounted to $4.50 per ton on pig iron, and $7 to $8 per ton on steel billets.

The position after the cessation of bounties, in December, 1910, left preferential duties of $1.50 per ton on pig iron and billets, and a general duty of $2.50 on both commodities. On the general market value of pig iron and billets, roughly $15 and $22 respectively, the preferential tariff affords a marginal protection of 10 per cent. and 7 per cent. Thus the help directly and indirectly vouchsafed the industry is now only about one-third of what it was. It is claimed by the advocates of the bounty that the growth of pig iron outputs from less than one hundred thousand tons in 1900, to about three-quarters of a million tons in 1910, was due entirely to the stimulus of the bounty, as was the correspondingly larger growth of the steel industry.

In defining the present position of the industry, the iron manufacturers state that before 1910 the duties and bounties enabled them to retain the Canadian trade in the face of foreign competition. Now, however, an inadequate tariff is the only safeguard. The situation is rendered acute by the depressed condition of the foreign trade. Large installations are under way, but it is now practically impossible to hold the Canadian trade.

It is stated emphatically that there was a definite understanding with the late government that when the bounties were withdrawn the duties would be readjusted. This has not been done, and the Canadian ironmaster considers that here he has a palpable grievance.

Specific complaints are not wanting. The manufacturers of such commercial products as agricultural implements, springs, axles, tools, windmills, etc., get practically free iron and steel, and, on the other hand are granted certain exemptions on the finished products that militate ultimately against the Canadian

pig iron producer. Again, the low rates of duty on the larger sizes and sections of rolled steel shut out the Canadian mills from a large part of the field. Further, Canada is able now to supply less than one-half of the 200,000 tons of wire rods and wire produets eonsumed within her boundaries.

The trade of Canada is growing rapidly. During the fiscal year ending Mareh 31st, 1911, Canadian imports of eertain steel and pig iron artieles were valued at $18,482,683. This is a sum almost equal to the entire production of Canadian plants. It is set forth that this implies the payment by Canadian eonsumers of about $12,000,000 in wages to foreign workmen. This money, spent in employing Canadian workmen, in Canadian industries, would build up several industrial eentres.

There is little virtue, apparently, in the "dumping" elause. A rigid tariff is required to prevent the wholesale demoralization of our markets when trade is depressed in the United States.

In short, the captains of the Canadian iron and steel industries believe strongly the establishment of those industries in an unassailable position is esscntial to the welfare of the eountry. They reeognize that radical ehanges in the tariff will be the only final remedy. Meanwhile, until the Tariff Commission will have looked into the subjeet, the industry clamours for temporary relief in the form of renewed bounties.

With invcstments aggregating $100,000,000; with 22,000 workmen dependent upon the suecess of these enterprises, and with an annual pay-roll of $13,500,000, the Canadian ironmaster has some right to make known his needs.

Only by long and intimate examination of the whole matter will right adjustment he reaehed. Meanwhile we ean see nothing to be lost and mueh to be gained in granting temporary aid to a threatened industry.

The iron and steel industries of Canada are what they have been made by general and speeial tariff provisions. Their past history must be taken into aeeount in any present legislative enactments.

THE CONSULTING MINING ENGINEER.

Painfully frequent are the evidenees of futility and misdirection in the expenditure of money and energy in every mining camp. Not only in the smaller prospects, but in larger mines, mines that are eonsidered models of good management, one ean deteet signs of wasted time, energy, and funds.

Mining, eareful and legitimate mining, has, at certain stages, enough inherent uncertainties. The superadded risk introduced by human folly, is aseribed most frequently to lack of luck. It is ascribable to no such thing. It is the removable cause of most of the losses that are written up against the business of mining.

The current belief that when three or four business men get together, ineorporate a company, and hire a mine manager, they are capable of giving proper instructions as to how a mine should be worked, has a strong hold on the popular imagination. After the almost inevitable failure, the organizers usually elaim that they have done the best they eould, that they have not spared themselves. This is all well and good from the point of view of morals, from a eommercial point of view it is nonsense. Failure has come beeause proper adviee was not sought, or beeause the poliey of the eompany was eontrolled by amateurs.

Now, instead of depending upon the wage-earner who opens up the property for them, if the small investors were to eonsult a **bona fide** mining engineer, or an economic geologist, weigh matters carefully with him, digest fully and diseuss freely his reeommendations, know why these reeommendations are made, and generally develop the logie of the venture, there would be infinitely fewer heart-burnings and vain regrets.

It takes a trained expert to determine the right scale in which a mining property is to be developed. The man who has charge of actual mining operations usually has special qualifieations. He may be an excellent miner, and he may or may not have that necessary sense of proportion that adjusts expenditure correctly. But he is very seldom blessed with a profound knowledge of geology. At nearly every phase of a mining venture's history geological diagnoses are required. Moreover the reports of every mine manager are the better for being ehecked up carefully. Exaggeration is a human and very common tendency. It will not prevail where an independent engineer is called in periodieally to examine and advise. In other words, the close auditing of a mine's physieal status is quite as necessary as the auditing of any commereial concern's affairs.

The average mine manager dislikes being subjeeted to the scrutiny of the technical man. There is no real ground for this feeling. No superintendent can honestly objeet to anything that renders his work more efficient. In no sense is he the inferior of the specialist. The superintendent is supposed to know his own field. His adviser speeializes in one or two braneh es, and, unless he is eharging exorbitant fees (whieh is remarkably seldom the ease), there is no reason to objeet to his assistance. A close parallel is offered by the physician who calls upon the surgeon to help him. All professors have their highly specialized departments. The profession of mining is more eomplicated than most others.

The mining geological specialist arrogates to himself no intellectual superiority. His training fits him for a eertain purpose. That purpose is to supplement the good work of the eompetent mine manager, and to help and guide the manager whose technieal know-

ledge may be deficient, but whose services are none the less practically valuable. The probabilities are that the latter can manage the detailed operation of the mine to advantage. For this very reason he is apt to need the general help that an outside specialist can offer. It is obviously to the advantage of all that independent advice be sought and used.

COAL MINING IN ALBERTA DURING 1910.

It has taken slightly more than one year for the Albertan Department of Public Works to prepare and publish its report. Consequently we have had to wait until now to comment upon the official figures of production, etc. We have sufficient knowledge of the printer's vagaries to make due allowance for a certain amount of delay; but to permit twelve months to elapse before issuing important returns argues departmental laxness.

The total output of coal from Albertan mines during 1910 was 3,036,757 tons, made up as follows:—

Lignite	878,011 tons.
Bituminous	1,896,961 tons.
Anthracite	261,785 tons.

Coke to the amount of 121,578 tons was produced from 196,249 tons of coal—a yield of about 62 per cent. Briquette production totalled 108,996 tons.

The substantial increase in coal output, namely 862,428, is the largest on record.

By far the largest sales were made in the Province itself, 1,291,721 tons being disposed of to Albertan consumers. Exports to the United States were 215,976 tons, whilst other provinces took 124,274 tons. The amount used under colliery boilers was 53,737 tons.

Of the Anthracite production the greater part was sold in Alberta and other provinces, only a few tons of each going to the United States, Lignite was sold to the amounts of 438,781 tons in Alberta, and 317,959 tons in other provinces; 27,397 tons being shipped to the United States. The average number of men employed above ground was 1,728; below ground, 4,090. The number of mines in operation was 154. During the year 7 mines were abandoned, and 42 new mines opened. Seven of these new mines were in bituminous or semi-bituminous beds, the remainder in lignite.

The number of fatal accidents underground was large, 59 in all, for a total of 4,090 employees, or 14.4 deaths per 1,000 men employed. These fatalities were classified thus:—

Falls of coal	4
Mine cars	8
Shaft accident	1
Gas explosions	1
Carbon Monoxide poisoning	31
Falls of rock	8
Explosions	2
Asphyxiation	1
Falling from chutes	3
Total	59

Upon the Bellevue disaster, which caused the loss of 31 lives by "Carbon Monoxide poisoning," the inspector refrains from comment, but promises a full report later on. His general remarks, however, are pointed. "A number of fatal accidents," he says, "which have occurred, more especially in connection with transportation, have been entirely due to lack of discipline, and if the Coal Mines Act and the special rules in force at these mines had been strictly observed it is possible that the number of these accidents would have been diminished. In order to remove, as far as possible, the dangers to be apprehended by persons being crushed between the moving cars and the chutes, the inspectors have been . . . . requiring such alterations to be made in the construction of chutes as local conditions will permit."

In addition to the underground fatalities, there were 36 serious and 51 slight accidents underground during the year.

Safety lamps are in use in all the mines of the Crow's Nest Pass District with one exception, and in all gaseous mines permitted explosives are used. Minor infractions of the Coal Mines Act have been vigorously punished.

Only four inspectors are employed by the Province. In view of the large number of accidents, and the immensity of the ground to be covered, this is a small staff. Disregarding the Bellevue catastrophe the death rate was still abnormally high, being 6.8 deaths per 1,000 men employed underground. This serious fact perhaps calls for immediate enlargement of the staff or for profound change of methods of inspection.

The Eight Hour Law is reported to be working satisfactorily, although the inspector alludes to the dangers arising from the consequent need of more rapid transportation.

Amongst the important developments of the year were the erection of one hundred coke ovens and a washer at No. 2 North Mine of the Leitch Collieries; the completion of a new tipple and plant at the collieries of the McGillivray Creek, Coal & Coke Co., Ltd.; the installation of a new tipple and electric equipment at the Bellevue colliery of the West Canadian Collieries, Ltd; and the largely increased output of the Crow's Nest Pass District.

It is regrettable that no detailed returns are presented giving the outputs of each considerable mine. We miss, also, the illustrations that usually accompany the report. In fact, it is high time that the Albertan Mines Branch issued a much fuller and comprehensive annual statement. The industry warrants it and the mining public needs it.

METALLURGY AT THE UNIVERSITY OF TORONTO.

Nothing could auger better for the future of the University of Toronto than the fact that there was no tincture of nepotism or of mere expediency in the selection of the man who has accepted the recently created professorship of metallurgy. Only after much casting of nets did the Governors come upon Mr. Guess—a Canadian, a graduate of a Canadian University, and, most important of all, a metallurgist who has made good in several of the largest smelting establishments on this hemisphere.

Professor Guess' achievements are set forth on another page. Here we may merely make the general statement that the choice was surprisingly wise, much wiser, in fact, than we ordinarily expect from academic autocrats. It will, therefore, ensure the live interest of progressive mining men, and will bring about a condition more nearly approaching equilibrium in the Faculty of Applied Science and Engineering.

To the least observant it is apparent that the University is entering upon a new phase. The first important step was taken two years ago when Mr. H. E. T. Haultain accepted the professorship of mining, an unenviable position when all the limiting and isolating conditions are considered. Common sense, had it been a factor in the debates of the Board of Governors, would have insisted at the same time upon the immediate appointment of a professor of metallurgy. This was not done. Valuable time was lost. Although, in the interval the Faculty has not lost in reputation, it has inevitably suffered by comparison with the better manned and equipped departments at Queen's and McGill. Negligence and indifference of this kind are incompatible with the dignity of our most powerful university, especially with the rapid development of the mining department before it as an object lesson.

However, an eleventh-hour conversion is better than none at all. Amends have been made, and a course in modern metallurgy is to be provided.

At this juncture it is our bounden duty to voice the convictions of the mining public in relation to the University. As we remarked in a former editorial, the mining department is being vigorously handled. But its usefulness is restricted by the traditionally conservative atmosphere and by very tenuous financial support. The new metallurgical course will suffer, to a smaller extent we hope, from the same drags. But possibly, the inclination of the authorities will be to allow the mining department to remain **in statu quo**, and to divert the larger streams of sustenance to metallurgy. No mistake could be more fatal than this. In the first place, mining and metallurgy, whilst they are both broad, and diversified subjects, are closely interdependent. One leads directly to the other, and the domains of each overlap and coincide in a thousand ways. No two studies could be more intimately associated. The success of the University's mining department alone has paved the way for the present expansion. This must not be forgotten.

Hence, if mining and metallurgy are to be properly taught at Toronto University, neither can be subordinated to the other. Each must be considered an integral part of an organic whole—at present, a microcosmic whole. And we repeat that the established course in mining must not be starved to feed its sister. Both will require very much more of the sinews of war than they are apt to get.

The University of Toronto derives its chief financial support from the Province of Ontario. The exchequer of the Province has been enriched by large amounts of money contributed directly and indirectly by the mining industry. Through mining the Province has had its wealth augmented, its settled areas enormously increased, and its name given world-wide advertisement. Surely the Provincial Government might properly insist that a more generous policy be adopted hereafter by the University in respect of mining and metallurgical instruction. The appointment of professors will be farcical unless they are given strong support, wide discretionary powers, and the assurance of such assistant-professors as they may need.

In one sense it is fortunate that no dead-wood exists on the present staff, and that there are no unfit and tenacious survivors of the unpractical era to be sloughed off. The path for the future lies clean and wide. The only obstructions that can or will exist will be placed there by the University itself.

THE OTTAWA MEETING OF THE CANADIAN MINING INSTITUTE.

Large preparations are being made for the Annual Meeting of the Canadian Mining Institute at Ottawa on March 6th, 7th and 8th. Respectably large representations are expected from England and from the United States, and the Ontario and Quebec cohorts will be more numerous than ever. British Columbia, Alberta, and Nova Scotia are sending official representatives and private members, and not a few unclassified foreign delegates are expected.

In several respects the approaching meeting is to be highly interesting and edifying. For instance it is announced that Mr. T. A. Rickard is to read a paper on gold mining in Nova Scotia. This will be a fruitful source of comment, and should induce a large representation from that Province. It is announced, semi-officially, that the Annual Dinner will be held in one of the spacious Parliament Building rooms. This, in itself, is an inducement as it will naturally imply the presence of many distinguished Parliamentarians. Possibly, also, His Royal Highness, the Duke of Connaught, will honour the occasion with his presence. And the Duke, we are sure, will find our Dinner a mild and

agreeable diversion, contrasting strongly with the formal affairs that bring fatigue and boredom in their train.

Ottawa in many ways is an ideal city in which to gather. A large attendance, a well-managed smoker, and a dinner conducted in accordance with established tradition will impress the legislative heart, and counteract the depressing effect of long papers. We hope that every member of the Institute will arrange to attend. An instructive session is assured; a good time goes without saying.

We have vivid recollections of our last Annual Meeting in Ottawa. Who can forget the tense wait for election results? Who does not remember the smoker? Or the bold Knight-errant who pirated the Russell elevator? Or the matutinal invasion of restaurants?

Perhaps our glory has departed. Perhaps the Institute has lost its love of high adventure. Perhaps the mantle of strenuous good-fellowship has fallen on other shoulders. Perhaps not. We are not downcast. We hope and believe that in Ottawa the reputation of the Canadian Mining Institute will be gloriously upheld, and that lustrous history will be made.

It may be that no scandal will be probed, no geologist convicted by his peers of tampering with Scandinavian hearts; it may be that the Secretary will not burst incontinently into song, nor may any instructor of youth break the speed laws on the hotel "lift," nor yet may the wanton miner from the North flaunt the colours of his clan on his expansive evening chest,—yet the roots of sin are with us yet.

In all seriousness all of us must strive in every way to make the approaching Annual Meeting an unqualified success both in its serious and its non-serious aspects. The opportunity is too large to be overlooked.

[Editor's Note.—As we go to press notice is received from the Secretary that the place of meeting is to be Toronto, not Ottawa. This change of venue does not imply any change of spirit in our editorial. If our readers will be good enough to read "Toronto" for Ottawa," and take for granted the historicity of the incidents referred to, no harm will be done. Toronto is as godly a town as is Ottawa.]

THE CHIBOUGAMAU REPORT.

To read aright the report of the Chibougamau Mining Commission one must be possessed either of prescience, or of a knowledge of the circumstances that led up to the action of the Quebec Government in appointing the Commission.

The vague northern hinterland of Quebec and Ontario is a prolific source of fairytales. The prospector goes there and comes back with large stories of mineral wealth. Only a fractional percentage of these stories will stand investigation. Thus, with these facts recognized, it was the duty of the Quebec Government duly to investigate the Chibougamau region, a region rich in rumour.

The net result of the Commission's findings is distinctly discouraging to those who had hoped for "boom" mining districts. The judicial opinion of Messrs. Faribault, Gwillim, and Barlow is diametrically opposed in tone and in substance to previously published reports. The attitude of the Commission is summed up thus in a quotation from these columns:—"Our duty, as the 'Canadian Mining Journal has very "well represented it' was to determine the general "geological character of the country, and to discover "how true were current tales of spectacular wealth. "The findings of the Commission must be accepted "as they are offered—as an appraisal of the present "results of prospecting in one section of Northern Que-"bec. It must not be misconstrued into a sweeping con-"demnation of a region that may yet prove entirely "worth while."

Statements as to the economic value of the Asbestos Island asbestos deposits, made by Dr. A. P. Low, are directly controverted by the Commission, as also are the statements of Mr. John E. Hardman, relating to the asbestos and to the gold-bearing areas of the Chibougamau Mining Company, Limited.

In two succinct paragraphs, which summarize their conclusions regarding the asbestos and the gold, the members of the Commission state that "the ore bodies "which have gold as their chief value do not contain "this metal in a free milling state in sufficient quantity "to make stamp-milling feasible;" and, as to asbestos "the asbestos noticed in the working faces of the vari-"ous open cuts, as well as in the dumps, is insignificant "in amount and altogether insufficient for their suc-"cessful development as mines." Similarly does the report deal with copper, nickel, and iron.

Although the Chibougamau Region may "promise a rich reward," the prospector is recommended to turn his attention to other "large areas of equal economic "importance . . in much more accessible portions of "Northern Quebec."

After reading the Commission's sizable report we are inclined to believe that it must have been remarkably hard work for Messrs. Faribault, Gwillim, and Barlow to fill the 216 pages. There is much matter touching on meteorology, topography, general geology, etc. The volume is carefully prepared, the editing is excellent—although we must incidentally deplore the use of such a misbegotten phrase as "data is"—and the photographic reproductions are of a high order of merit. But, except to save the Commission's face and demonstrate its literary ability, we wonder if it was all worth while!

We do not for a minute, however, wish to jeer at the work of the Commission. It was politically and otherwise necessary that the truth be determined. The Commission's pronouncement is bold, definite, and uncompromising. It is exactly what it should be—with the possible qualification that it might have been given in tabloid form instead of as soup.

THE MUCKRAKER.

Some years ago the journalistic world was electrified by the exploitation of Thomas Lawson's personality in "Everybody's Magazine." The accompaniments of this exploitation furnished the groundwork of commercial prosperity for that magazine. No thoughtful person took Mr. Lawson seriously, even at that time. His appeals, various and vociferous as they have been, have not helped to establish his prestige.

In the search for magazine material, Providence has ordained that Porcupine, the new gold mining camp of Ontario, should be the point of contact between the rake and the raked. A person whose name is Trumbull White, writes up Porcupine in the February issue of "Everybody's." Mr. White is a sensationalist. This is more than obvious to anyone who reads his article. But, (and this is the important feature) Mr. White represents a certain cult of destructors who tread where angels have a very genuine fear of treading. If, for instance, Mr. White had known his subject, he would not have dealt in so many preliminary platitudes. No one really suspects Porcupine of being a "poor man's" camp. Everyone knows that each new mining camp is bound to breed buzzards and other birds of prey. Similarly we are all grateful to the kind Providence for having kept Porcupine out of the range of operations of Mr. Thomas W. Lawson.

The virtuous Everybody's is late in the field. Corrective influences have been long at work. There is nothing of good that can be accomplished by the type of journalism that gave Everybody's its start in life.

EDITORIAL NOTES.

In our editorial remarks on January 1st, we, inadvertantly failed to acknowledge the existence of the Sudbury and Sherbrooke Branches of the Canadian Mining Institute. Our excuse is the fact that neither Branch advertises its activities. We shall be glad to hear from both.

The dividend payments of 125 per cent. made by the Bell Asbestos Mining Co. for the year 1911, throws into sad relief the condition of Amalgamated Asbestos. They also go to show that trade conditions are not so inherently bad as has been rumoured.

Mr. P. A. Robbins' report on the Hollinger, which appears on another page, is not commented upon in this issue of the Journal. It will be fully discussed in our next issue.

The offer of the city council of Port Arthur to assist the Atikokan Iron Company in erecting a large steel plant is contingent upon the renewal of the iron bounties. Levers of this kind will, no doubt, affect Ottawa considerably.

CORRESPONDENCE

THE EXCULPATION OF MR. WHITE

The Editor,
"Canadian Mining Journal,"
Toronto, Ont.

Sir,—My attention has been drawn to the fact that, in a letter from the pen of Mr. James White, which appears in your last issue, taking exception, not unjustly, to your permitting rash, inaccurate, or misleading statements to appear in your Journal, he incidentally refers to a geologist in Ottawa having been guilty, amongst other things, of political activity.

As it may reasonably be supposed that one while denouncing inaccuracy, etc., will make no inferences or suggestions that are not strictly correct and well-authenticated, and as almost all geologists in Ottawa are connected with the Geological Survey, a reader of his letter might, perhaps, form the conclusion that some geologist connected with the Survey had been politically active. In the case of a Government geologist this would be a serious violation of the Civil Service Act. To remove all possibility of such suspicion being placed upon any member of the Survey, I desire to state that so far as I know or have been able to ascertain, no geologist at present in any way connected with the Geological Survey has been guilty of any political activity whatever, or for that matter of anything else suggested in the above letter. It is, therefore, evident that Mr. White was not referring to any official of the Geological Survey, and would deplore any such unwarranted inference.

Yours truly,
R. W. BROCK.

Ottawa, Jan. 23rd, 1912.

"THE INCINERATION OF MR. WHITE."

Editor Canadian Mining Journal,
Toronto, Ont.

Sir:

Mr. Jas. White, secretary of the Canadian Commission of Conservation, having seen fit to use me as a chopping-block in getting at you, I beg sufficient space to reply briefly to some of Mr. White's direct statements impugning my veracity and general intelligence.

Regarding Mr. White's assertion that anyone with even a superficial knowledge of mines and mining knows my statements to be absolutely false, I admit, cheerfully, that the only people who have rushed into print with assertions that my statements were false, were those who possess, like Mr. White, a superficial knowledge of mines and mining. In reply to Mr. White's direct question, I beg to observe that I do think that a single county of Michigan contains four and three-quarter billions of tons of iron ore. Having lived in that county for ten years, it necessarily becomes perfectly obvious, to any "conservationist", that I lack positive information on this point, such as Mr. White has been able to obtain at Ottawa.

Mr. White terms me erratic for advancing the novel proposition that the Guggenheims should be allowed, because they have made a losing investment in copper, to recoup themselves in Alaska by taking up large areas of coal lands, in defiance of the law. Inasmuch as I advanced no such proposition, Mr. White is demolishing a man of straw, a task in which "conservationists" excel, from much practice. The administration of the American laws in Alaska is shamefully lax and unjust, and the refusal of our government to permit either the Guggenheims or anyone else to develop coal mines in Alaska is simply disgraceful.

Regarding Mr. White's assertion that if myself, et al, will devote our attention, etc., we might achieve something material, and raise ourselves in the estimation of all right-thinking persons, permit me to observe that Mr. White scarcely comprehends my standpoint. The gentlemen in this country, and possibly in Canada as well, who call themselves conservationists, have proven themselves, in the main, so illogical, so wasteful, so extravagant in language, and so utterly unreliable in their assertions on all vital points, that I, for one, am opposed, frankly and absolutely, to their programs, which are mainly political, and to their personalities. If by "all right-thinking people" Mr. White means the conservationists, so-called, I may state that I lack the slightest desire to stand well in their estimation, preferring to maintain my self-respect, and tell the truth, as I see it.

Mr. White, like our "conservationists", and other "reformers", on this side of the line, seems to be gifted with a very copious flow of language, but his ideas become a trifle gelatinous at times, and his view of the facts decidedly hazy. As to his scientific attainments and value as an authority, it seems to me that these are very clearly set forth in his own statement, that all that is needed to eliminate poisonous fumes from the smoke of the Washoe Smelter is to "install special appliances"—this statement coming from the chief forester of the United States, according to Mr. White, and being quoted by him as the final word in the matter. It is obvious to Mr. White, and all other true "conservationists" that the chief forester, being a simon-pure conservationist, is the final authority on all metallurgical problems. The fact that none of the metallurgists agree with the chief forester, on this metallurgical problem, seems very damaging to the men who make a livelihood in the practised metallurgy.

We have our "conservationists" on the run in this country, and propose to build a fence around them, for our own protection. They will be treated with all humanity, but, in the interests of public safety and sanity, cannot be permitted longer to run at large.

Very truly,
HORACE J. STEVENS.

Houghton, Mich., Jan. 24, 1912.

THE BELLEVUE MINE DISASTER

Written for the Canadian Mining Journal by R. W. Coulthard.*

In the Summary Report of the Mines Branch of the Department of Mines, for the year 1910, I notice a report (pages 144 to 157), on the coal mine disaster at Bellevue Mine.

This report was written by Mr. Joseph G. S. Hudson.

In the beginning of the report Mr. Hudson sets down the Letter of Instruction, which he received at the time he was asked to investigate this disaster. This letter reads as follows:—

Ottawa, December 12, 1910.

"Dear Sir:—

"You are instructed to proceed at once to Bellevue near Frank, Alberta, for the purpose of investigating the recent accident from an explosion, which occurred at the coal mine at that place.

"1. It will be your duty to obtain a full description of the disaster.

"2. You will endeavour to ascertain, if possible, the cause of the disaster.

"3. And ascertain whether the method of mining is defective, in that it prevented the escape of the miners after the explosion.

"4. To make such suggestions as will in future avoid at that mine or mines with similar lay-out loss of life from the probable cause mentioned under No. 3.

"You are to be present at the inquest, and take notes of all that is said in evidence.

"To report on any other essentials which may be necessary for a comprehension of the causes of the disaster, and its possible prevention in future from similar causes.

"Yours truly,
(Signed) Eugene Haanel,
Director of Mines."

"Joseph G. S. Hudson, Esq.,
Mines Branch,
Department of Mines."

In as far as these instructions were followed from the standpoint of facts, and knowledge of the condition of affairs, I am willing to leave the decision to those who are conversant with these things.

I would remark that in endeavouring to elucidate the method of exploiting the No. 1 Mine (Page 145), I am at a loss to understand certain passages of description therein, and there are besides certain omissions which show a lack of knowledge or information in connection with both the workings and the geological features of the ground.

*Gen. Mgr., West Canadian Collieries Limited, Alberta.

The writer of the report, however, makes his statements boldly, and without any qualification or reservation.

In his "History of the Accident", he begins with the affair of October 31st, 1910, and states that (page 146) "considerable anxiety was felt as to the probabilities of a second explosion following the first." Just where Mr. Hudson acquired the right to make this statement I am at a loss to know, and not only consider it erroneous, but vicious. He also follows with the statement that certain mining men gathered together to hold a consultation on the matter, and to test for carbon monoxide, carbon dioxide, and carburetted hydrogen gases, in the return air of the mine. His further statement in regard to consultations between mining men is much distorted, and is a misstatement, just as much from information given as from that which is withheld.

It may possibly be that Mr. Hudson was not able to learn everything in this connection, but if so he should at least make the admission.

Mr. Hudson would make the reader believe that the mine was not entered until thorough examinations had been made from the surface openings as to gas and temperature. He also states that several tests were made on the surface to this effect, after which it was decided that an exploration party would go into the mine, and make an examination therein. This is an absolute perversion of fact. I myself in company with the General Superintendent, and the Superintendent of the mine, entered the mine about an hour after the occurrence of the blast, and made, as far as was possible, an examination of conditions.

Further it is stated that on entering the mine it was clearly demonstrated that "**an explosion of considerable force had occurred.**" This also is not true. None of the examining party was of opinion that there were any results of severe force shown in the mine.

I might also say that contrary to a statement in the report we did not find the coal in chute No. 81 "perceptibly warm."

In regard to what Mr. Hudson considers very important evidence from a fire boss, who claims to have written down carefully his observations at the time of inspection, I might state that this matter was not brought out in the evidence at the time of the inquest, and should not, therefore, be considered in the report.

I will also say that in many particulars the observations of this fire boss are at variance with those of mine officials in a higher capacity, who were more capable of arriving at conclusions. Where this fire boss states that boards and canvas opposite the 6th crosscut were burned he is entirely at variance with more expert observation and opinion.

In quoting a portion of the evidence of the District Inspector of Mines (page 147), Mr. Hudson states that he "found a thick coating of **coal dust** on the electric light globes, etc." The evidence distinctly states "**dust**" not "**coal dust**", as Mr. Hudson might wish to interpret it. As a matter of fact, and in conversation since had with Inspector of Mines, what he meant by "dust" was in reality "sludge" from the haulage roads which had caked and hardened on the lamp globes. This "sludge" is composed of coal, rock, horse manure, and all other refuse, which is to be found on travelling gangways. It is besides very wet. In fact the gangway might be termed swampy, and right at this point I wish to disabuse anyone's mind of any trouble arising from dust in this mine, contrary to the suspicions which may be inspired by the insinuations in Mr. Hudson's report. As a matter of fact it is considered one of the dampest mines in the district.

Mr. Hudson has not, to my knowledge, ever visited the mine in question, so cannot criticize with authority.

On page 148, the statement is made that although the pillars from chute 61 to 70 had been extracted, the pit records show that up to October 29th no cave-in had taken place. "On the outside of the cave-in rooms "52 and 57 and pillars 59 and 60 are in working, get-"ting round the cave at 75 chute to the face of the "pillar 250 feet up the gangway." In answer to the above I might state that there have been hundreds, possibly thousands of caves in this mine in the old workings, which certainly had not been reported, nor had it ever been expected that they should be. They are taken for granted as in all other mines. As to the last sentence it is meaningless to me, and I am unable to grasp that the author wishes to convey.

Proceeding, Mr. Hudson states that the witness (meaning the Provincial Inspector of Mines), also asserted that he had a conversation with myself as to the cause of the explosion, and the remedies to be taken to put the mine into better condition; and that the mine was put into condition by "**restoring the ventilation and cleaning the main gangway from broken timbers, etc.**" The "etc." in this statement is the most important portion of the instructions there were issued at that time, and had Mr. Hudson taken the trouble to have made enquiries, unless of course he had already done so, he would have learned that the precautions taken after this affair were numerous, costly, and of a nature such as anyone conversant with conditions would have considered efficient.

Following this Mr. Hudson makes a great point of the fact that the Secretary of the United Mine Workers of America, Bellevue division, No. 18 district, telegraphed to Mr. John T. Stirling, the Provincial Inspector of Mines, at Edmonton, that the men working in the Bellevue mine desired an inspection of the mine. Had Mr. Hudson enquired into the politics of this Union at the time, he would have discovered two facts:

1st. That they were at that time electioneering for their annual election of officers.

2nd. That also at this time their Socialistic representative in the Provincial House, was endeavouring to obtain some most remarkable revisions to the Mines' Act, in which he was aided by the Union Officials.

I might state that Bellevue mine was not the only one about which complaints were made at this time. As a matter of fact, there were few mines in the west which were exempt from criticism, and for the political reasons above mentioned. I know for a fact that a most serious complaint was made regarding the Canada West Collieries, but upon investigation it was found to be farcical in the extreme. In other words it was again the story of the boy calling "Wolf! Wolf!" to the great discomfiture of the shepherds. The very fact that the mine officials, as well as the Pit Committee, appointed by the miners themselves, had reported nothing of an unusual nature in the Bellevue mine, goes to show that they considered everything normal therein.

The criticism, therefore, of the Mine Inspectors is in my opinion unwarranted, and had a little more investigation been made on the part of the author, I think it would have been omitted. I have every reason

to believe that the Mine Inspectors in this Province perform their duties conscientiously and intelligently, and in this I think I am supported by any reasonable, unprejudiced opinion.

A further instance in connection with the gas which was reported in this mine by the Union is very important, although Mr. Hudson sees fit not to mention the matter. It is, that when the Secretary of the Local Union was asked where the gas of which he complained was located, and which was the source of the telegram to the Provincial Inspector, he replied that it was in the working faces inbye of 82 chute and not, mark you, in the old workings.

Why was not this fact brought out in the Government Report?

To the average layman the fact of there being gas in the working places might appear to be a dangerous feature. This, however, is not the case, as it is met with in most coal mines. This is the reason the regulations do not allow blasting in places where gas is found. I wish, therefore, to clear up any misunderstanding which may be taken from this statement.

The remark is also made (page 149) that "The miner working in 123 room said that he had seen gas about three feet back from the face, **but brattice was 12 feet back.**" He also states that the room was stopped working until the gas was cleared out. In the name of all that is practical and sense-inspiring, how much closer does Mr. Hudson wish the brattice to be to the face? As a matter of fact even at this distance it is nearly always disturbed or blown down. The mention of gas in working faces by a practical man for the purpose, I presume of conveying to the reader the idea of carelessness or incapacity on the part of the management can hardly be sustained.

The imputation is childish.

The report also states that two men were sent to make a special inspection and examination of the section of the mine **"where the big cave-in from the roof eventually occurred."** In order to correct this misstatement, I would say that the big cave-in of the roof did not eventually occur at this point at all, nor is Mr. Hudson in a position to place the initial location of the trouble.

The report also mentions that it was not reported to the Inspector that a new regulator had been put in between 79 and 80 chutes. In as much as this regulator had been in for over 12 months previous to this. I hardly think it would be necessary to report such a matter at this time.

Further, at the end of page 149, I see that Mr. Hudson quotes from Rule 32, Chap. 25, 1906, Coal Mines Act of the Statutes of Alberta. We, however, had at that time discovered that this Act was obsolete, and were using the 1908 Act in its stead.

I notice that the report quotes from the evidence of George O'Brien, fire boss from Coleman (Mr. O'Brien, by the way, was from Coal Creek, B.C.), as to the character of the burns on certain men, who were victims of the disaster. No doubt Mr. O'Brien's evidence was quoted because of its melodramatic effect. There was other evidence produced at this inquest to show that they were not of as extensive a nature as stated by this witness. This, however, has not been mentioned.

Further, on page 151, the author of the report declares that "After consultation the Provincial Inspector of Mines—Mr. Stirling—decided that the mine be closed, and no one allowed to enter it until after the Company had carried out some of the proposed alterations." This, I affirm, is at variance with Mr .Stirling's evidence, and I can state here and now that he made no such statement. It cannot be found in the evidence, and I think if Mr. Stirling is appealed to himself he will bear me out in what I say.

On page 152 of the report we have the cause of the disaster clearly outlined to us by Mr. Hudson. Of recent years there has been considerable controversy over the causes of mine explosions. These controversies have been carried on by men who have spent practically a lifetime in the study, yet in spite of the great diversity of opinions in this regard, we have but to read this report to find all other theories summarily exterminated and must perforce accept as the only cause, that of explosion of gas and coal dust ignited by the same old medium of flame. Truly the matter is settled now and for all time.

Firstly in this section re "Cause of the Disaster," we are told that "The seams of coal are all located "in mountainous districts, hence are subject to a very "heavy pressure from the strata overlying the coal "worked." I would like the author of this report to let me understand as to what he considers the thickness of strata necessary to produce a very heavy pressure, as for myself I was always of the opinion that the pressure was not heavy enough in our mines.

Also he states that because of the great thickness of our seams, and the high angle of inclination, therefore, the dangerous conditions increase as the **"underground workings go deeper from the surface."** This reasoning to me is somewhat vague, and I think I may here be permitted to interpolate an expression of scepticism as to the finality of the statement.

At the bottom of page 152 the remark is made "That "an explosion of gas had occurred was demonstrated "by the large amount of carbon monoxide gas and "after-damp encountered by the exploration party at "this section of the main gangway, and also that 3 of "the 4 bodies recovered between 53 and 54 were "burnt." In reply to this I will say that there was nothing in the evidence to show that there was a large amount of carbon monoxide gas and after-damp. On the other hand it was specifically remarked by experts who went into the matter thoroughly, that there was evidence of the presence of but little carbon monoxide gas and after-damp, and this was one of the reasons put forth that the cause of the disaster must have been other than what has been assumed by Mr. Hudson.

Further, on the top of page 153, he states "One im- "portant point that did not come out in the evidence "was, that a stratum of rock situated in the roof "immediately over the coal is composed of a coarse "grained sandstone, highly impregnated with iron- "stone." Heretofore it has been borne in upon me that most of the important points are those that did not come out in the evidence. Also there were some very important points brought out in evidence which have been entirely overlooked. However that may be I might say that this statement should not have been included in this report unless confirmed by evidence. I might, however, state that the assertion as it appears is entirely erratic. In regard to Mr. Hudson's theory as to the probable cause of the disaster, I have nothing to say. He is welcome to it as are others to theirs. It is, however, in my mind, the product of very hasty judgment.

He makes the statement "That the defective state of "ventilation in the old workings was favourable to "explosive conditions was manifest; for the ventila- "tion was by scales of air through the board stoppings "on the main gangway, and not by direct current." I might say that the evidence which was adduced at the inquest went to show that there was a perceptible current at the top of the old workings.

Further Mr. Hudson makes no mention of the fact that the air was taken in from 46 chute (the outermost portion of the old workings in question), whence it was carried to the top of the workings, inbye along the top, and up 81 chute to the surface. This may possibly put a different light on this point. Furthermore as I stated, there was no evidence of a large volume of carbon monoxide gas.

Method of Mining.

Mr. Hudson states that "The system of working the "coal is to drive chutes (having 50 or 60 feet centres) "on the full pitch of the seam, and to run the coal "down on the chutes to the main gangway, where it is "loaded on the mine cars." If by this only Bellevue mine was referred to, the author of the report is correct. If, however, he refers to all the mines in the district he is wrong. We have ourselves two other collieries in operation in this district, and neither one of them follows this system.

The impression is left that the Bellevue Mine is not provided with more than one exit. This is a misstatement.

Further the statement is made "**There was not any "evidence submitted** at the inquest to show that any "of the men who survived the shock of the explosion "..... made the slighest attempt to escape from the "mine by travelling up the exceedingly steep chutes "to the surface." This statement is contrary to the evidence which I have before me. Also it is contrary to fact. I would further bring to mind that the counter gangway in our workings is travelled daily from chute 45 into the end of the workings.

General Deductions.

In regard to the establishment of rescue stations I note that the author of the report is somewhat contradictory in his method of maintaining same. In one place he states that "Dominion or Provincial Governments "should be responsible for their instruction and main- "tenance." (I presume he means instruction of men in the use thereof). Immediately after this he asserts that "Perhaps the most satisfactory results will be "obtained by the different coal companies in mining "districts in the establishment of a series of strategic "stations, co-operating and maintaining these stations "as a first-class insurance asset." Further along in this section he says: "The respective coal companies to "contribute to a general fund, assessed on the number "of tons of coal mined. From this fund the apparatus "will be purchased, installed, and maintained." Note that it is the companies who bear all the expense in regard to this, but do not forget that the perpetrator of this report further states that in determining upon a suitable location for a central station, and the substations, the mines' employees must be consulted.

Emergency Access to Mine Plans.

The writer of this report should wish to convey the impression that the blue prints of the plans produced at the coroner's inquest were inaccurate. Further along he states that they should be kept up and corrected to periods of every three months. This I might mention was the practice followed at this mine. Further I will assert that it was this method of correcting to periods of every "three months," which may have given the plans the appearance of being inaccurate, in as much as the quarterly survey was just at that time being made.

He further makes the misstatement, that the plans were not available to the mine managers from surrounding collieries. This is the first time that this has been brought to my notice, and upon enquiries from the various mine managers who were on the ground at the time, I find that none of them asked for the plans upon first arriving on the ground. I was informed, however, that on the following morning two of the mine managers met in the office of the company, and upon requesting to see plans, they were immediately produced.

This mention of plans behooves me to remark upon what I consider the very unprofessional manner, in which Mr. Hudson obtained, and retained possession of the plan of the Bellevue mine, which he has evidently made use of in preparing his report.

This plan was produced by the Company at the inquest, and at the conclusion of the investigation, it was the Coroner's duty to see that the plan was returned to the Company. Without, however, obtaining my consent he approached the Foreman of the jury, who, by the way, had no jurisdiction in this matter whatever, and obtained possession of this plan. The Coroner who sat upon the investigation, informs me that he later wrote Mr. Hudson, for the return of this copy, but the latter refused this request.

There are other copies of the plan of the Bellevue mine, which he could have obtained for the asking, and his tactics in obtaining property which did not belong to him, are, I think, anything but exemplary for a professional man.

In conclusion I wish to express my admiration for the capabilities of the author of this report. The valueless generalities contained therein are in my opinion marvels in their superficiality, and I have no doubt the Department of Mines must feel proud of the achievement.

METALLURGY IN BRITISH COLUMBIA IN 1911

By E. JACOBS

In the metallurgical field there was little of unusual interest as regards actual achievement during the year. The successful use of the Dwight-Lloyd sintering process at the Consolidated Mining and Smelting Company of Canada's smeltery at Trail; the experiments with the Elmore Vacuum Process plant—at the Britannia Mining and Smelting Company's copper concentrating mill, Britannia Beach, Howe Sound, and at the Silverton Mines, Limited's silver-lead-zinc concentrator, on Fourmile Creek, Slocan Lake district—that were in a large

measure successful; the continued investigations concerning the extraction and recovery of zinc from complex silver-lead-zinc ores, such as occur freely in Slocan district; the more effective use of precipitating and filter presses at the Hedley Gold Mining Company's 40-stamp mill, Hedley, Similkameen; the further reduction of smelting costs at the Granby Consolidated M.S. and P. Co's copper smeltery, Grand Forks, Boundary district, and the erection and equipment of several mills—one for milling gold ore and three or four to concentrate silver-lead or lead-zinc ores—these constitute the chief evidences of progress in metallurgy in the province in 1911.

It will be seen from the foregoing paragraph that metallurgy is not here being considered as "the science of smelting," as a narrow definition would regard it; rather is it being dealt with on the broader basis of its being taken as "the art or operation of separating metals from their ores or other combinations."

Now it may be convenient to supply some detail in the order above given, so this will be done. First, though, one of the difficulties that confront a layman may be pointed out. A visit was paid to one of the larger smelteries in the province; in the absence of the general manager no one about the works was authorized to give for publication particulars of the work being done or results achieved, so only a superficial idea could be obtained concerning these important subjects. Later, in response to a written application for information for annual review purposes, the following was obtained: "At the smeltery.....have been installed. Beside this, a great many small changes have been made in order to facilitate handling and sampling ore." The reference thus made to large reduction was contained in 33 words, some of which have been omitted here so that the identity of the works may not be disclosed. But it surely may be likened unto the great difficulty experienced by a people ages ago who were required to "make bricks without straw." However, here goes, as they say in the vernacular.

Dwight-Lloyd Roasters at Trail.—Early in the year two units of the Dwight-Lloyd sintering process machines were put in at the Consolidated M. and S. Co's works at Trail, and these were placed in operation in May. Since then they have been used for roasting gold-copper concentrate from the Le Roi No. 2 Company's Josie mine, Rossland, and mixed silver-lead ores having some zinc in them. All the information obtained concerning the roasting operations at Trail is that the roast of the gold-copper concentrate was perfect, the result being a sintered product favourable for smelting in the blast furnace, but similar success had not resulted in the case of the lead-zinc ores, which sometimes required to be roasted a second time. The average metal contents of the concentrate, as shown by shipper's assay, were: Gold 1,425 oz., silver 0.747 oz., and copper 25.8 lb. per ton. No information was obtained as to the physical condition, that is the degree of fineness to which the charge was reduced before being sintered, nor was a complete analysis asked for, but it is known that the concentrate is from second class ore remaining from sorting an auriferous chalcopyrite with pyrite and pyrrhotite, in a siliceous gangue.

There are a number of Dwight-Lloyd plants in operation in various parts of the world—United States, Mexico, Australia, and Europe, but prior to the installation at Trail there was not one in Canada. It is claimed that this machine is particularly adapted to handling concentrates, flue dust, and all classes of fine ores, converting these into a coarse cake which, owing to its strength and porosity is highly suitable for reduction in the blast furnace. It will economically sinter and desuslphurize mixtures having from 8 to 18 per cent. sulphur, and of sizes from one-quarter inch down to 200 mesh or finer, making from them a coarse porous product which will contain between 2.5 and 5 per cent. sulphur. The statement has been made in connection with several of the plants installed that there has been a noticeable increase in the capacity of blast furnaces running on a charge containing sinter produced by the process—in one case as much as 20 per cent. This is due to the great porosity of the sinter and the fact that it is practically fused to a slag. Further advantages urged are that cost of installation is much lower than that of any other roasting appliance, and that cost of operation is less than that of the old hand-rabbled reveberatory roasters.

Elmore Vacuum Process.—Similarly, no detail was obtainable relative to the results of experiments with the Elmore Vacuum Process plant in British Columbia. Several years ago a small Elmore plant was put in at the Giant Mine, Golden mining division in northeast Kootenay, but the results obtained did not lead to the adoption there of the process for commercial purposes for the reason, as officially reported by the district Gold Commissioner, that while the process proved a success as far as the separation of the lead and barytes was concerned, the cost of oil and acid made the treatment too expensive for use on such low-grade ore as that of the Giant mine. This cost was higher from the fact that the mine is situated at an elevation of about 3,500 ft., and seven miles in from a landing place on the upper Columbia River. The character of the ore treated here is indicated in the following reference to it by the Provincial Mineralogist, Mr. Wm. Fleet Robertson: "There appears to be a line of contact of limestone on the south with a black-coloured slate on the north. Along this line of contract the lime seems to be more or less completely altered into barytes for a width of from 20 to 30 ft., when the barytes gives place gradually to a silicification of the limestone. This zone of barytes is in parts heavily impregnated with galena to the extent of from 5 to 10 per cent., together with some zinc, arsenic, and antimony sulphides. The galena is fine-grained, and occurs in numerous small seamlets running through the barytes gangue, and carries silver value in about the proportion of one ounce to the per cent. of lead. As far as could be determined by inspection, the mineralization diminished with the barytes, both being strongest next to the slate."

In connection with the work done on Britannia ore by the Elmore plant, it will probably be of interest to note, first, the general character of the ore occuring on this property and, next, the nature of concentration methods in the past. The ores of the Bluff and Jane mines, of the Britannia group, are thus described in a report prepared for the Dominion Department of Mines by Mr. Robert R. Hedley: "The Bluff ore is an association of pyrite and chalcopyrite, with some little sphalerite and galena in a quartz gangue, often of a cherty nature and exceedingly hard. The Jane ore is distinctly the result of secondary enrichment, and consists of pyrite and chalcopyrite, in schist. Ore from the Bluff will probably average 1.75 per cent. copper, varying between 1 and 4 per cent. throughout its entire extent. The richer ore is found in fairly large masses, and does

poorer ore is, however, finely disseminated. In the Jane not require fine crushing to release the mineral. The the ore occurs in four well-mineralized beds or bands, aggregating in width some 250 ft., that may be mined to yield about 3 per cent. copper. To handle these ores to best advantage some concentration is necessary."

Summarizing the information given the writer of these notes when, some time ago, he visited the Britannia concentrating works, the following briefly presents the position: "In concentrating Britannia ores the result aimed at was the removal of the excess of silica, in order to make a desirable product for smelting, with a minimum of copper loss, rather than to concentrate to a high-grade copper product. The extremely hard matrix of much of the ore limits the application of concentration. Experience proved that the copper losses in the slimes, resulting from fine crushing, were too great, and that a large part of the ores contained mineral that could easily be separated from its gangue without fine crushing. The practice for some time was treatment which gave a concentrate about neutral as to its iron and silica contents, and from the picking belt a shipping ore containing a large excess of silica. A modification adopted was to take from the picking belt both the high-grade neutral shipping ore (for shipment to the smeltery in its crude state) and the waste, and to leave the remainder to be crushed for concentration by jigs and on tables.

During the last two years Mr. Robert H. Leach, who recently resigned as general mianager of the Britannia Company, has carefully watched the results of the concentration operations at the Britannia mill. The latest comment on this subject is contained in the following: "The graded crushing and concentrating mill has been worked out to a very satisfactory point, results showing extraction to have been about 80 per cent., which, it will be recognized, is very high for a chalcopyrite ore. This high extraction has been made possible by the fact that ore newly-discovered in the mines contains a large percentage of coarse blocky sulphide that is recovered by means of hand-picking and coarse jigging. On the fine concentration and very careful experimenting with a full-sized working unit of the Elmore Vacuum Oil Process plant has shown that high recoveries can be made from the fines and slimes, so that this process supplementing hand-picking and jigging will contribute appreciably to make the total extraction high, while the product will be nearly neutral so far as smelting is concerned. The gist of this comment appears to be that the Elmore Vacuum process has been successful in treating fines and slimes from Britannia ores, and this in "a full-sized working unit" of the plant.

Preliminary results in treatment of ore from the Silverton Mines Company's Hewitt mine, while distinctly encouraging, were not decidedly successful. However, local conditions should be taken into account, for it is probable that the unit of the Elmore plant put in there has been operated under difficulties separate from it and against its having opportunity to demonstrate its suitability or otherwise to recover the silver-bearing zinc it is sought to save there. The Wakefield mill is an old one, and it has been out of repair to an extent that has interfered with continuous operation. It has been overhauled lately, so it was too soon, when the mill was visited early in November, for those directly concerned to state what results might be expected under ordinarily favourable conditions in connection with the running of the mill plant.

Progress in Zinc Investigation.

Two years ago the Dominion Government was urged to make investigations in connection with the smelting of zinc ores, with a view to finding a solution of the problem of how to turn to profitable account the great quantities of zinc and lead-zinc ores known to occur in the province, especially in mines in Kootenay district. Several months later the sum of $50,000 was voted for the purpose of conducting investigations and making experiments, these being under the direction of the Mines Branch of the Canadian Department of Mines. Mr. F. W. Harbord, of London, England, was authorized by the department to investigate and report on the zinc-smelting plants and processes of Europe, and Mr. W. R. Ingalls, the prominent authority on zinc in America, was engaged to act in an advisory capacity to the department. Afterward, bulk samples of zinc ore from Kootenay mines were forwarded to McGill University, Montreal, Quebec, so that reduction tests might be made with a view to determining what treatment process will best suit the ores, respectively. Before quoting Mr. Ingalls' progress report, earlier endeavours to overcome the obstacles to economic utilization of the zinc ores of the Kootenay will be briefly stated.

After the zinc question had been for some time engaging the attention of leading mining men and others interested in mining ores containing lead and zinc, the Associated Silver-Laed Mines of British Columbia, an organization of silver-lead mine owners and managers, instructed its special committee to memorialize the Dominion Government to engage a high authority on zinc and its treatment to investigate and report on the zinc ores of the Kootenay. In connection with this movement, Mr. A. C. Carde, then resident manager of the Payne mine, Slocan, pprepared and published a long statement outlining the benefits to be derived from fully investigating the zinc resources of British Columbia as to their extent, value, character, etc., and giving much information relative to the occurance of zinc in numerous silver-lead mines in Slocan district and elsewhere in British Columbia.

A direct and important result of this agitation was the appointment of a commission "to investigate the zinc resources of British Columbia and the conditions affecting their exploitation." The investigation was conducted by Mr. W. R. Ingalls, who had as his assistants Mr. Philip Argall, of Denver, Colorado, and Mr. A. C. Garde, of Slocan, B.C. The report of this commission—a volume containing about 400 pages—was published by the Dominion Government in 1906.

Progress Report of W. R. Ingalls.—Under date August 23, 1911, Mr. Ingalls made to the Director of Mines Ottawa, Ontario, a progress report of the zinc investigation authorized in 1910, as follows:

"The general plan of the investigation was fully outlined in my report to you of January 28, 1911. Since that itme work has been prosecuted, especially in the field of electric smelting, this being done in the metallurgical laboratory at McGill University, Montreal under the immediate direction of Dr. Alfred Stansfield. A large number of experiments have been made with several forms of furnaces, certain of which have been of rather elaborate construction, and with a variety of raw material.

"Our early experiments were directed chiefly toward a discovery of the metallurgical conditions that have heretofore prevented a satisfactory condensation of zinc as molten spelter. While I cannot say that these experiments have afforded us a complete explanation of those conditions, they have taught us a good deal, but in spite of the knowledge acquired, we have been so far unable to master the difficulties.

"We have indeed produced some small quantities of spelter and in certain experiments have condensed a fairly large proportion as molten metal, but we have not yet been able to do that at will.

"Our experiments have thrown light upon the principals of furnace design and have led us to condemn several types that we have tried. Our work has indicated that in order to achieve any material improvement over the ordinary practice of zinc smelting, it is necessary to abandon certain features of the latter and contemplate continuous charging of the ore and reduction material and discharging of the residium without interfering with the process of distillation. These conditions introduce a multitude of perplexing difficulties that can be worked out only by tedious experimentation.

"At the request of the secretary of the Canadian Mining Institute, and with your permission, I presented at the meeting of the Institute in Quebec, in March, 1911, a paper on 'The Problem of Mixed sulphide Ores,' that concisely summarizes the state of the art in the treatment of such ores and the naural obstacles that block procedure in certain directions.

"A careful scruting of the work on the treatment of such ores that is being done by other metallurgists and investigators has been maintained, and I have examined numerous proposals that have been presented with more or less detail, both through your office and to me directly but I have not discovered anything save one that in my opinion holds out any promise of successful aparation to the conditions existing in British Columbia, I am conducting correspondence respectng this, but as to inaugurating experiments upon it, I am disposed to hold them in abeyance pending further progreiss in our electric work.

"I regard the electric work as being of particular interest as an exploration in a virgin field of unknown possibilities. Doubtless with the same idea a great deal of work in this field is being done by numerous investigators in both Europe and America. I have been informed within a few weeks that there are now two electro-thermic zinc smelteries in operation in Scandinavia, namely, one at Trollhattan, Sweden, using about 7,000 h. p., and one n Sarpsbor, Sweden, using about 4,000 h.p. Operations at those works were inaugurated five or six years ago, but according to my information the results were for several years commercially unsatisfactory, and it is only recently that it has been claimed to have become possible to make spelter from ore on an industrial scale. The companies operating these works maintain absolute secrecy respecting them, and I have not been able to learn any details as to their operations.

"Apart from the work in Scandinavia, as to the commercial success of which no information is available, the electric smelting of zinc ore is, in spite of all claims to the contrary, not only still in the experimental stage, but is in the infancy of the experimental stage. Even if the metallurgical difficulties can be overcome, which is possible, I am of the opinion that no one, except perhaps the Scandinavians, is yet in a position to make any reliable estimate of commercial advantage or commercial results in any way. It is, howvcer, well worth while to determine the possibilities and publish the results for the general benefit, unveiling so far as possible the secrecy that is likely to be maintained as to investigations in this field by private interests, having always in mind, of course, the hope that our work may develop a process that will be commercially applicable to the treatment of the zinc ores of Canada."

The French Process.—Mr. A. Gordon French, a metallurgical chemist who had previously been making experiments in connection with the reduction of lead-zinc ores, has patented a process which was the outcome of his investigations and experiments. A well known metallurgist thus describes and comments on this process:

"Mr. French's process aims at the extraction and recovery of the zinc contained in ores such as the silver-lead-zinc ores of the Slocan district of British Columbia, leaving as a residue the silver-lead, iron, and gangue matter, which would be afterward smelted in the same manner as a lead ore free from zinc.

"The advantages claimed for such treament would be:

"1.—The recovery of the zinc in a metallic and marketable form.

"2.—By the removal of the zinc from the original ore—

"(a) The riesdue would become a lead ore free from zinc and as such would obtain a lower smelting rate and avoid any 'zinc penalty' that would have been attached to the original ore;

"(b) The residue, carrying all the lead and silver of the original ore would be less in weight than such original ore, by the weight of zinc extracted. Consequently, it would contain a higher percentage of lead and silver and there would be a proportionately lessened tonnage to smelt.

"3.—The silver actually occurring in the blende would remain in the residue and so be recovered by smelting, whereas it would be lost if the zinc-blende were to be separated from the lead ore by any mechanical process.

"**Ores Experimented Upon.**—The ores experimented upon have been chiefly zinc concentrates containing galena, zinc-blende, iron pyrites, and iron carbonate together with the gangue matter (quartz and shade), and apparently a percentage of manganese in some form.

"**Treatment.**—The ore is crushed to pass through a 10-mesh screen. It is then roasted in an ordinary calcining furnace until the ore is nearly 'dead', which reduces the original sulphides, theoretically, to oxides, although in practice there are probably sulphates and some sulphides left, depending in quantity upon the completeness of the roast.

"While the roasted ore is still in the calciner, at the hot end, a small percentage of nitre-cake* in powdered form, is thrown in with the ore and thoroughly rabbled into it, making an intimate mixture. This mixture is stirred (rabbled) under heat for a short time. The

*Nitre cake is a bisulphate of soda with some free sulphuric acid in it and is a waste product of sulphuric acid works.

all converted into sulphates. When this action is con- effect of this is that the oxides in the ore are almost sidered complete the charge is remoed from the furnace and allowed to cool.

"This roasted and treated ore, after having sufficiently cooled, is transferred to a wooden leaching tank, and water, in which a small quantity of nitre-cake has been placed, is added, and this dissolves out the sulphates of zinc and manganese, together with the sulphate of soda formed by splitting up of the nitre-cake.

"The sulphate of lead is not soluble and the silver can be rendered insoluble. These remain in the tank, as does all gangue.

"Mr. French claims that the sulphates of iron are not leached out until all the zinc is in solution, and if the leaching is stopped before the zinc is all out the iron will be left undissolved. The solutions in the works did not carry much iron, which seems to confirm his statement.

"The filtrate from the leaching tank, containing the sulphates of zinc, manganese and soda are run into a wooden box in which are hung alternate sheets of zinc and lead, immersed in the filtrate or electrolyte. The zinc plates are connected to the positive pole and the lead sheets to the negative pole of a direct-current dynamo of low voltage.

"The action of the electric current is to plate the zinc sheet with metallic zinc which accumulates in a dense hard mass over the entire side of the plate. When this deposit of zinc has attained the desired thickness it is lifted out and a new zinc sheet put in its place. The electrically deposited zinc is afterwards easily stripped from the zinc sheet, the latter to be used again and the former now ready for market after having been melted and run into bars.

"On the negative pole manganese is precipitated as a black oxide of manganese in a powder which is brushed off occasionally and collects in the bottom of the box. This black oxide of manganese has a commercial value.

"The filtrate from the leaching tank flows into the electrolytic precipitating box and out again, being pumped back to the leaching tank, this flow keeping the solution at a normal strength.

"The plant that Mr. French has at Nelson is only an experimental one and is very crude, sufficient only to demonstrate the principle and is capable of treating only a batch of from 500 to 1,000 lb. of ore at a time. The whole plant is home-made. It consists of a small calcining furnace, with a hearth about 20 ft. long by about 5 ft. wide, built of concrete with a brick arch, heated by cordwood used in an ordinary firebox, working doors on one side only.

"The calcining hearth is inclined at an angle of about 10 deg. for the upper part of its length but is level for the lower 5 ft. The ore is fed in at the upper end through the side door by shovel and is rabbled by hand.

"There is one leaching tank, also two wooden tanks for the storage of solutions."

Stamp Milling and Cyaniding.

In this branch of saving of lode-gold the Hedley Gold Mining Co. is by far in the lead in British Columbia; in fact it has been practically alone. However, the Motherlode Sheep Creek Mining Co. is preparing to also operate a milling and gold-saving plant on distinctly modern lines, though for the present on a smaller scale.

Hedley Gold Mining Co.—The ore from this company's Nickel Plate group of mines is an auriferous arseno-pyrite, with gold virtually its only valuable product. The percentage of extraction made during 1911 from approximately 57,000 tons of ore of an average value of $12.10 per ton was 92 per cent., or $11.13 per ton. This is an estimate made before the close of the year, so the official figures, when made public later, may vary somewhat from this, but taking this amount as a basis of comparison, it is four cents per ton higher than the average recovery in 1910 from 46,826 tons, and is believed to represent a closer saving of value. Incidentally, it may be mentioned here that the company paid in 1911 four dividends, totalling $300,000 or 25 per cent. on its issued capital of $1,200,000.

In the company's mill are four 10-stamp batteries; stamps are 1,050 lb. each, and they drop 7¼ in. at 99 per min. Screens, formerly 20-mesh, are now 14-mesh. There is not any saving of gold on amalgamating tables. The pulp is classified by Bunker Hill screens; the coarse product is concentrated on corrugated belt Frue vanners and the vanner tailing pulverized in a Gates tube-mill having Montana-Tonopah lining. The tube-mill product together with the fine (less than 60-mesh) from the Bunker Hill screens, after regrinding, passes to classifiers and hydraulic sizers, the coarse going thence to smooth-belt vanners and the fine to Deister tables. The tailing from the vanners goes to sand vats and that from the tables to slime vats, sand and slime being thus kept separate. No sand is coarser than 60-mesh when it reaches the leaching vats; leaching takes 20 days in upper and lower vats. Slime is collected in 200-ton settlers, and pumped thence into agitating tanks of similar size and having mechanical agitators. The gold solution is decanted from the agitating tanks and the slime residue passed to two Oliver filter presses. The gold solution from both agitating tanks and filter presses is treated by two Merrill presses, standard 36-in. frame with 20 and 10 leaves, respectively. Consumption of cyanide is about 1 lb., and cost per ton of sand 18 cents. Zinc dust is ⅝ lb., and cost 5 cents. Approximately 300 tons of concentrate has been produced monthly—probably more now that tonnage capacity of mill is larger; it runs high in gold and is sent to the smeltery at Tacoma, Washington, for extraction of value.

It is permissible to add that during the year development work in the lower levels of the mines placed in sight fully $1,000,000 worth more ore, so that the outlook for 1912 is bright and the prospects for continuance of dividend-paying most favorable. Mr. Gomer P. Jones is general superintendent.

Motherlode Sheep Creek Co.—The Motherlode Sheep Creek Mining Company, a State of Maine corporation, of which Mr. John McMartin, of Cornwall, Ontario, is the principal owner, and Mr. Wm. Watson, of New York, vice-president and general manager, has put in a 10-stamp mill in connection with which the best talent available has been employed in designing and equipping, so as to ensure thoroughly modern and effective milling and gold-saving treatment of ore from the Motherlode mine, which was first proved to have an ample supply, opened to a depth of 500 ft., and with a sufficient quantity blocked out to keep the mill run-

ning continuously for three years. It was expected this mill would be completed and in operation by the end of the year, but it is not known to the writer if this expectation was realized.

The plant is housed in a frame building covered with corrugated iron, dimensions 187 ft. long and 87 ft. wide. The ten stamps are each 1,250 lb. Size of screens to be used will be determined after ore-crushing has been commenced. The pulp will pass to Merrill patent sizing cones; thence the oversize will be pulverized in a tube mill and be put through a 200-mesh screen joining the undersize from the sizing cones. The entire product will be passed over silver-plated, amalgamating plates, tailing going to a Dorr thickener; overflow pumped back to return battery water tank and the underflow to Pachuca tanks where it will be agitated in cyanide solution by compressed air. Product from the Pachuca tanks will go to another Dorr thickener; overflow, containing the bulk of the gold in solution, will be put through a Merrill clarifying press, which will remove last traces of sand preparatory to precipitation; underflow to mechanical agitator tank from which Merrill slime presses will be fed. Sludge will be washed in the presses and the gold-bearing cyanide solution then flow to the gold tanks, at the bottom of the mill, also containing cyanide solution from the clarifying press. The solution, with zinc dust, will be pumped thence to the top of the mill where the gold will be collected in a Merrill precipitation press designed to hold a month's output. The scheme for refining, which may be modified later, is as under: First, drying precipitate in steam drier, grinding, fluxing with soda, borax, etc., and litharge briquetting, cupelling, in a large test down to lead bullion and continuing cupellation down to high-grade bullion. Amalgam from plates will be retorted and melted in a Case melting furnace.

Power for operating the mill machinery will be derived from Pelton water-wheels, water being delivered at mill at average effective pressure of 600 ft. head. Water will come from two creeks, by continuous red fir stave pipes 2,100 and 4,500 ft., respectively, and then by 7,000 ft. of steel pipe 16 to 14 in. Compressor at mill to have a capacity of 1,440 ft. of free air per minute, and be fitted with a specially designed variable capacity valve gear to ensure highest efficiency from water available.

Other Gold Stamp Mills.—Of eight or ten stamp mills in Nelson mining division, varying from 80 stamps in the mill of the Ymir Gold Mines, Ltd., down to 4 stamps in a Sheep Creek camp mill, only three were operated over the greater part of the year, namely those of the Granite-Poorman mines near Nelson city, and the Queen and Nugget mines, respectively, at Sheep Creek. The Granite-Poorman mill has 20 stamps crushing quartz ore occurring in country rock described as mica-syenite. An application for information concerning the year's progress was not replied to, but a local newspaper during the year printed much stuff about metals of the platinum group having been found on the Granite-Poorman property and what was going to be done at the mill to recover these metals, but, so far as known to the writer, nothing has yet been done on a commercial basis. The Queen, also with a 20-stamp mill, is understood to have continued milling quartz containing auriferous pyrite; no information has been supplied relative to recent results, but earlier operations, with ore averaging about $13 in gold per ton, gave a recovery of 55 per cent. on the plates, with the remainder of the recovered value contained in an iron concentrate which was sent to the smeltery for reduction. The 4-stamp mill at the Nugget did good work, making a total recovery of 2,611 oz. of gold and 776 oz. of silver from 3,500 tons of ore; in future this small plant will be used only to treat ore accumulating from the development faces until such time as the permanent milling plant shall be put in. Though comparatively unimportant in itself, this small mill did much to attract notice to Sheep Creek camp, and in large measure led to the bonding and later development of the Mother-lode mine and installation there of a mill equipped with the latest effective gold-saving appliances.

It may be of interest to note that, as recorded in a report issued by the Canada Department of Mines, some extremely interesting work was done several years ago near Nelson by Mr. Douglas Lay (who is now superintendent of the Van-Roi silver-lead-zinc mine and concentrating mill), in the treatment of a very low-grade auriferous pyritic ore. A small installation of a Chilian mill, Hendryx agitator, etc., was made; experiments carried on for a period extending over some months demonstrated that, with modifications of what was known at the Hendryx process, an extraction of 85 per cent. of the gold content could be obtained at a cost of $1.40 per ton for mining and milling; but for commercial purposes a plant of much greater capacity would be required. The experimental plant, however, was a model of economical arrangement.

The owners of the Kootenay Belle gold mine, at Sheep Creek, during 1911, acquired by purchase the 14-stamp mill previously leased, together with water records; the Athabasca mill was worked intermittently; it was reported that the Jewel 15-stamp mill, erected in recent years but as yet but little used, was operated during a part of 1911, but no information was made public. Practically all other mills in the province equipped for treating gold ores were, so far as known, inoperative.

Lower Copper—Smelting Costs.

In his last annual report, for the fiscal year ended June 30, 1911, Mr. Jay P. Graves, Vice-President of the Granby Consolidated Mining, Smelting and Power Co., Ltd., made the following reference to cost of mining and smelting: "Notwithstanding the lower tonnage shipped and the disadvantages under which it was mined by starting and closing the operation of the mines at various periods, the cost of mining was only one cent per ton greater than the year previous, while the cost of smelting was reduced three cents per ton. I consider this excellent work in view of the conditions that prevailed at both mines and smeltery. I believe it is safe to say that the condition of our mines and smeltery is now such that when we are able to operate at full capacity much better results will be achieved and lower costs than we have ever before had will be secured." The tonnage for the two years referred to by Mr. Graves was 950,563 tons for the later year, and 1,175,548 tons for the earlier; the lower costs were on a tonnage reduced in quantity by 19 per cent. Conditions during the greater part of the calendar year, 1911, however, were entirely unfavourable to low costs, for a strike of coal-mine employees in south-eastern British Columbia and Alberta, whence is obtained the usual supply of coke for use in the blast

furnaces, lasted over two-thirds of the year, and the much greater cost of obtaining coke from Pennsylvania, though incurred for a short period by the Granby Co., was prohibitory to smelting the characteristic low-grade ores of this company's mines at a profit, so operations were suspended until after the settlement of the strike and the making available again near the end of the year, of the ordinary sources of coke supply. The disastrous effects of the labour troubles above referred to upon copper production by the Granby Company during the year under review, will be evident from the following figures: Copper produced by company during calendar year 1910, approximately 20,000,000 lbs.; during 1911, 11,000,000 lbs.

British Columbia Copper Co.—This company worked its mines and smelting works throughout the year, notwithstanding the serious disadvantage attending the production of copper at the comparatively high cost of Pennsylvania coke. The tonnage of ore smelted at its works at Greenwood, Boundary district, was about 580,000 tons, and the metals recovered therefrom were: Gold, 29,600 oz.; silver, 127,000 oz., and copper, 9,650,000 lbs. These approximate figures compare favourably with those for 1910, when the tonnage smelted was about 456,000 tons, and the metals recovered were: Gold, 25,640 oz.; silver, 85,000 oz., and copper, 7,351,000 lbs. The increase in tonnage was, therefore, a fraction higher than 27 per cent., and in copper produced, 31 per cent. The great bulk of the ore smelted in 1911 was from mines in the Boundary district, operated by the company—only 15,420 tons came from its mines in the adjoining State of Washington. As costs for 1911 will have been abnormal, it would not be fair to use them for comparative purposes even were they available (which they will not be for a few weeks), but those of several previous years may be given. The cost of producing, refining and marketing per pound of fine copper, after crediting expenditure with the value of gold and silver recovered, has been as follows: For fiscal year ended November 30, 1908, 9.996 cents; 1909, 9.829 cents; 1910, 9.048 cents. If conditions be normal throughout 1912, a further decrease is probable, since management is fully competent and plant thoroughly efficient. As the Granby Company's operations are under similar advantageous conditions, a like further improvement may also be looked for with confidence.

Other Copper Smelting Companies.—As few particulars were obtained of the year's operations at other copper smelteries in British Columbia, it is not practicable at present to give much detail. During eleven months to December 1, the Consolidated Mining and Smelting Company of Canada, Ltd., with smelting works and electrolytic lead refinery at Trail, smelted 308,146 tons, chiefly of crude ore, though a proportion was concentrates. Including receipts during December, estimated at 22,000 tons, the year's total tonnage may be placed at approximately 330,000 tons, and the value of the several metals recovered therefrom as follows: Gold, $2,745,000; silver, $715,000; lead, $770,000; copper, $520,000; total, $4,750,000. Quantities of metals have not yet been obtained, but for suggestive purposes the several totals of the last fiscal year (to June 30, 1911), follow: Tons smelted, 388,785. Contents: Gold, 119,067 oz.; silver, 1,458,758 oz.; lead, 24,026,015 lbs.; copper, 4,421,988 lbs.; gross value, $4,437,901. The production of the calendar year shows an increase in gross value of about $312,000. This result is the more noteworthy since the tonnage smelted in the fiscal year was nearly 60,000 tons greater than that during the calendar year.

The Tyee Copper Co.'s smeltery, at Ladysmith, Vancouver Island, owing to insufficiency and irregularity in receipt of supplies of ore, is not operated continuously, but only intermittently. During 1911 the furnace was in blast probably six out of twelve months; there was smelted 35,300 tons of ore, from which was produced 6,755 tons of matte, value of which (less refining charges), was $761,850. It is likely, though, that in 1912 an aggressive policy will be adopted to overcome present transportation difficulties (largely excessive freight charges for transportation of ore), and a sufficient supply of ore to keep the furnaces running at near capacity be secured. Three directors of the company, who recently went from London to British Columbia to investigate local conditions, are understood to intend recommending their colleagues in England to accept their view of the local situation and take steps for an early enlargement of the scope of operations.

Smelting With Oil Fuel.

The following information relative to a demonstration of the use of oil as fuel for smelting copper ore, being part of a report made last summer by Mr. Thos. Kiddie, metallurgist, of Vancouver, B.C., who had made several earlier trial runs at the same works—the old smeltery at Van Anda, Texada Island—is of interest:

"The ore mixture smelted consisted of Boundary district ore, iron ore as a flux; and copper slag from a previous operation. The furnace was started at 11 o'clock a.m., using two burners until it became sufficiently heated, when two more were started. Everything went along satisfactorily and slag began to flow at 12 o'clock, noon. The slag was hot and increased in quantity until it ran a pot of slag in one minute of time up to 2.30 o'clock p.m., during which time it smelted without trouble or interruption.

"Allowing one hour for the heating up of the furnace—a very conservative allowance—we used 157 gallons of oil in 2.33 hours, and 60 gallons for heating up the furnace, or 217 gallons in all. This gives an average of 14.6 gallons of oil per ton of material smelted, equal to 43.8 cents per ton of ore. The rate of smelting was 110 tons per 24 hours, an increase of more than 100 per cent. over the results obtained during the best previous demonstration.

"I have no hesitation in saying that these conditions can, and will, be much improved upon after certain changes shall have been carried out, so that full advantage may be taken of better and more complete combustion of the oil, when the cost of oil consumed per ton of material smelted should approximate 30 to 35 cents per ton of ore. The saving of labour costs at the furnace I estimate at 9 cents per ton of ore."

New Slag Disposal System.

The excessive cost of continuing the hot-slag haulage system in use at the Granby Company's smeltery at Grand Forks, Boundary district, has caused the management to make provision for disposal of the slag at less cost. For several years the blast furnace slag was granulated by water and conveyed in flumes to the dump; eventually this method of getting rid of the slag was found difficult, a sufficient grade not being

obtainable, as the dump was filled. Then haulage by several 14-ton steam locomotives in 44 cu. ft. slag cars was substituted for granulation, and the level of the dump raised considerably during following years. Latterly it has been necessary to haul the slag about three-quarters of a mile before it could be dumped, and this involved large expense in maintenance of locomotives, slag cars, and railway, so a new system has been devised and the slag from two furnaces will be disposed of by it, pending practical experience of its advantages over the hot slag haulage method.

Central storage bins have been built below the level of the present dump, and to these the granulated slag will be sluiced in flumes. After having been dewatered, the slag will be taken by conveyor belts up an incline trestle and distributed from moveable hoppers. When, later, the top of the incline shall be reached, much of the space along the trestle between the storage hoppers and the highest part of the trestle having meanwhile been used for dumping purposes, a level trestle built to a height of 100 feet, and at right angles to the incline, will serve as a stage from which to dump the slag, and when the dump shall be filled to that height, the platform, or floor, will be moved along as the filled dump shall be extended. For some time a second line of conveying belt will be pushed out, telescope-like, and this device will provide for extension of the dump at the high elevation for some distance. Further development of the system will be arranged when necessity shall arise. Meanwhile the system now about to be used is expected to provide means of disposal of from six to ten millions of tons of slag. Later, when it shall have been in practical operation for a while, an opinion as to its effectiveness can better be given, but if, as is expected it will do, it shall prove successful, the slag from all the blast furnaces, eight in number, will be disposed of by this means.

Concentrating Mills for Silver-Lead Ores.

Several more mills have been erected and equipped for concentrating silver-lead ores, and in two or three instances arrangements have been made for producing a silver-zinc as well as a silver-lead concentrate. Of these mills, that of the Van-Roi Mining Co., on Four-mile Creek, near Silverton, Slocan Lake, was in operation during about nine months of the year. The quantity of ore treated and production of metals during six months to October 1, was as follows: Ore treated, 22,427 tons. Metal contents of 1,214 tons silver-lead concentrate: Silver, 100,887 oz.; lead, 1,585,960 lbs.; zinc, 220,960 lbs. Of 1,598 tons of silver-zinc concentrate: Silver, 47,507 oz.; lead, 54,340 lbs.; zinc, 1,457,320 lbs. Production for the remaining three months of the year was proportionate—say about half as much as that given above, since the quantity and grade of ore treated monthly remained about the same. A mill for the Standard mine, also in Four-mile camp, was completed in November, and concentration of second-grade ore commenced, first-class being sorted out and shipped to the smeltery in its crude state. The Portland Canal Mining Co. completed its mill in Portland Canal district, and after operating it for a time, enlarged its capacity to 75 tons per day. The output consisted of two products—an iron concentrate, having its chief value in gold, and a silver-lead concentrate. A mill to treat 50 to 60 tons of ore per diem, will concentrate ore at the Monarch mine, near Field, on the Canadian Pacific main-line railway. The ore is principally lead, but there are shoots of it containing much zinc also. Some 20,000 to 25,000 tons is blocked out, and development of more ore is in progress. Changes and improvements were made at several other concentrating mills, but there is little, if anything, out of the ordinary to note in connection with their operation.

Work of Geological Survey in Western Canada in 1911.

A number of Canada Geological Survey field parties gave attention to Western Canada, doing chiefly geological and topographical work, during the field-work season of 1911. Most of these pursued their investigations in British Columbia; the others were engaged in Alberta, with the exception of one party that worked in Yukon Territory.

Field Work in Alberta.

Dr. Heinrich Ries, Professor of Economic Geology at Cornell University, Ithaca, New York, and Mr. Joseph Keele, of the Survey permanent staff, continued their investigations, commenced in 1910, of clay deposits in the prairie provinces and British Columbia. As noted in the last "Summary Report" of the Survey, "with settlement of the country the demand for clays suitable for all kinds of clay products becomes urgent. If found, important industries are developed; without them, a serious burden is imposed on the communities concerned." The information relative to the clay resources of the western provinces, thus obtained by the Survey, will be both dependable and valuable.

Mr. D. B. Dowling continued the work he commenced in 1909 and also carried on in 1910, exploring the coal-bearing rocks on the eastern slope of the Rocky Mountains, north of the Canadian Pacific main line of railway. In 1911 he finished mapping the coal area immediately adjoining the Grand Trunk Pacific Railway in the Rockies, the coal fields along which are of special importance. This supplemented his work in 1910, when he delimited the coal formations in the neighbourhood of Jasper Park, Yellowhead Pass. He also visited numerous localities in Alberta and Saskatchewan, where new coal mines are being opened.

Mr. W. W. Leach made a study of the geology and measured a number of sections, preparatory to the publication of a map of the Blairmore-Frank coal field, through which the Crow's Nest Railway passes. This field was examined by Mr. Leach in 1902, and the Survey published his report and map of it. Now it has developed into such an important coal-producing area that the Survey is bringing up to date the available information relative to it. Mr. W. H. Boyd, chief topographer, had a large party working in the vicinity of Coleman, Blairmore, Frank, Bellevue and Hillcrest, obtaining data requisite for publication of a topographical sheet on a scale of one mile to one inch. He also completed a detailed map of Turtle Mountain and the Frank landslide. It was the intention of the director of the Survey to visit Frank at the time the commission appointed by the Dominion Government to examine the condition of Turtle Mountain and to report the result of their investigations as bearing upon the probability or otherwise of another slide occurring and the possible danger to life and property, but serious illness prevented Mr. Brock from meeting the commission at Frank in October, as had been arranged he should do. The report of the commission, which consisted of Mr. G. S. Rice, of the United States Geological Survey; Dr. R. A. Daly, formerly geologist

of the International Boundary Commission, and Dr. Willet G. Miller, geologist for the Province of Ontario, has not yet been made public.

Survey Operations in British Columbia.

British Columbia was privileged in having the benefit of the valuable services of by far the greater number of Survey parties engaged in the West, as is shown by the following notes:

Mr. John A. Allan continued his study of a section along the Canadian Pacific Railway, across the Rocky Mountains. He also made a reconnaissance in the Beaverfoot range and investigated the known mineral deposits there. An interesting report on his 1910 work in the Ice River district is contained in the "Summary Report" for that year.

Dr. C. D. Walcott, of Washington, D.C., Secretary of the Smithsonian Institution, who during three years, 1907-10, had been studying the Cambrian series about Field and east along the C. P. R., spent the 1911 season in investigating the Cambrian fauna of the Rocky Mountains, in the vicinity of Field. In the course of this work Dr. Walcott has secured many most beautiful fossil specimens, concerning which he has placed on record valuable information.

Mr. S. C. McLean did the triangulation for a topographical map of the Windermere district, East Kootenay, following similar good work done in the interior of Vancouver Island, in 1909 and 1910.

Mr. Stuart J. Schofield continued his investigations in East Kootenay, and spent last season in studying the geology and ore deposits in the country southwest of Cranbrook; he also examined a group of deposits around Kimberley, in another part of Fort Steele mining division. With the provision of railway transportation facilities northerly from Cranbrook, up the valley of Kootenay River, and thence beyond Windermere, down the Columbia Valley, the work of Messrs. Schofield and McLean is timely and will be of much service to prospectors and other mining men, giving attention to that part of East Kootenay.

Mr. O. E. LeRoy, who commenced late in the season of 1908 to give attention to the Slocan district, and continued his investigations during two seasons that followed, last year examined the geology of 100 square miles in the vicinity of Nelson; beside this, he supervised the work of Mr. C. W. Drysdale, who mapped an area of 16 square miles, embracing Franklin camp, north fork of Kettle River, Boundary district. Mr. A. C. T. Sheppard completed the work on the topography of Slocan district, with which he had previously assisted Mr. Boyd in 1910.

Dr. R. A. Daly made a reconnaissance of the area covered by the Shuswap sheet, with a view to a report being issued on this area, the map of which has already been published by the Survey.

Mr. L. Reinecke studied the geology and ore deposits of the Beaverdell district and adjacent country, west fork of Kettle River, Boundary district, the topography of which he had been engaged on during the 1909 and 1910 seasons.

Mr. Charles Camsell examined the gravels of Tulameen River, for the purpose of obtaining further information regarding the occurrence of diamonds at Olivine Mountain, Tulameen district. He also made a study of Steamboat Mountain, Siwash Creek, and Fraser Canyon, beside making a reconnaissance into the country west of Lillooet.

Mr. Charles H. Clapp followed up his 1910 geological work in the vicinity of Victoria, Vancouver Island, by making a detailed survey of the Nanaimo district, in which is situated the producing mines of the Nanaimo coal field. A visit was also made by him to the Cumberland-Comox and Suquash coal fields.

Messrs. R. H. Chapman and K. G. Chipman were again engaged in mapping portions of Vancouver Island. Last season's work embraced Nanaimo, Alberni, and Cowichan Lake. The work for the northern part was done by Mr. Chapman, while Mr. Chipman undertook it in the southern part.

Mr. G. S. Malloch made a traverse from Hazelton to the Groundhog Mountain coal basin, and examined in a preliminary way the south end of this basin. He also investigated the geology of the Kispiox Basin, and visited a number of the more recently discovered metalliferous deposits near Hazelton.

Mr. R. G. McConnell, who spent the season of 1910 in studying the geology and ore deposits of the Portland Canal district and made a long report thereon, which report was printed in the "Summary Report" for that year, completed his work in that region, and then made a study of the geology and mineral deposits on Observatory Inlet and Salmon River.

In Yukon Territory.

Mr. D. D. Cairnes, who in 1910 spent the season in Atlin district, B.C., last year resumed work in Yukon Territory, in which he had previously been engaged during three seasons—1907-9. His 1911 work included studying the geology of an area 60 miles long and 5 miles wide, along the Yukon-Alaska boundary, between the Yukon and Porcupine Rivers. Beside this, he made a preliminary examination of the quartz veins in the Klondike district.

From the Director's View-Point.

It will be at once admitted that the Geological Survey of Canada continues to do a great deal of most valuable work in western Canada. In this connection it is of interest to have the view of the Director of the Survey, who, in the last published "Summary Report" observed, under the head of "Field Work": "The geological and topographical field work undertaken by the Geological Survey during the past season has, as usual, been economic in its bearing, most of it directly so; but a little has been on the broader problems of Canadian geology the solution of which is required for the interpretation of the facts gleaned in the detailed examination of the mining districts. Most of the fields selected are those in which work has been specially asked for by the mining profession, boards of trade, etc. Not all such requests received could be met, on account of the lack of specially qualified men to take charge of the operations. So far as was possible, however, this was done. The guiding principle in the selection were to choose those districts in which the work would be likely of most immediate or of greatest value."

THE NEW PROFESSOR OF METALLURGY AT THE UNIVERSITY OF TORONTO.

The appointment of Mr. George A. Guess to the position of Professor of Metallurgy in the University of Toronto, is an event of prime importance. It is only the beginning of a sane recognition on the part of the University Board of Governors of the imperative need of finishing the lop-sided structure that now exists.

Mr. George A. Guess is a mitigated Canadian. On Ontarian by birth, his academic training was received at Queen's University, from which institution he graduated, in the year 1894, with the degree of Master of Arts, a degree that then implied in certain courses strong specialization in the sciences.

The first venture of the young graduate was in south-eastern British Columbia. In those days the college product had a hard row to hoe. The paternal instinct had not then been developed in the professional bosom. The graduate had to look out for himself. His ambition usually was to run an assay office. He was regarded with a hostile eye by manager and miner. In short, his path was strewn with no roses.

After experiencing the usual vicissitudes, Mr. Guess, wholly on his own merits, formed connections with Canadian and American smelting interests that gave him a fair start in his profession. It was at about this time that the orbits of Mr. Guess and of Mr. H. E. T. Haultain, at present his fellow-professor, crossed—without damage to either. Together they evolved and perfected the Guess-Haultain laboratory electrolytic apparatus for the estimation of copper, lead, etc.

Of Mr. Guess's whole professional career it is impossible to give a detailed account. An attempt to penetrate his armour of reticence or modesty—or alloy of both elements—turns the point of the keenest enquiry. Suffice it to say, that he has specialized for a number of years in the metallurgy of copper ores in the United States, Mexico, and South America. The Greene Cananea Copper Company, operating in Mexico, is one of the largest and most noted of its kind. Mr. Guess was in charge of smelting and concentrating investigations there for two years. Leaving there to become assistant superintendent of the Tennessee Copper Company, within a year he was promoted to the position of Metallurgical superintendent. At the Tennessee plant, pyritic smelting is practised on a large scale. The ore capacity is about 40,000 tons per month. Smelting costs are as low, if not lower, than those of any other American concern, and it may be mentioned that Mr. Guess himself was a factor in reducing expenses to their present level.

The next move made by Mr. Guess was to Peru. Here, in the rarified atmosphere of the Andes, he performed the onerous duties of metallurgical superintendent for the Cerro de Pasco Mining Company. The scale upon which operations are conducted at this plant is indicated by the monthly output of 4,000,000 lbs. of fine copper, rich in silver. The plant is situated at an altitude of 14,000 feet above sea-level.

In the course of his professional work, Mr. Guess has visited all the more important copper smelters and refineries in the United States. His opportunities have been exceptionally favourable to the rounding out of his knowledge and judgment. He is typically the product of large commercial responsibilities successfully assumed. And, praise be, he is a Canadian.

The **Canadian Mining Journal** greets Professor Guess with both hands. The warm sympathy of the mining fraternity of Toronto was sufficiently shown at the last local meeting of the Canadian Mining Institute. The willing co-operation of the whole body of Ontario mining men may be counted upon by the University, provided the University does its fair share in treating rightly its departments of mining and metallurgy.

PERSONAL AND GENERAL

Mr. Stanley Leckie returns from Europe this week.

Mr. Martin Nordegg is expected in Toronto on January 31st, after a long absence in Germany.

Mr. J. M. Eakins, formerly manager of the Foley-O'Brien, has returned to Toronto, after a professional visit to Cuba.

Mr. Chas. J. Coll. for a number of years general manager of the Acadia Coal Company, Limited, Stellarton, Nova Scotia, has severed his connection with that company. Under Mr. Coll's management the Acadia Coal Company's outputs have been steadily maintained and enlarged, until during the last year all previous re-

cords have been exceeded. The sinking of the famous Allan shafts, the construction of steel bankheads, and the installation of electrical equipment at the Allan and Albion collieries, were some of the many features of his work.

Mr. Coll has been constantly active in all matters pertaining to the improvement of methods, the fighting of mine fires, and in mining matters generally. For two years he was president of the Mining Society of Nova Scotia, and has been a member of the Council of the Canadian Mining Institute for some years. It is with sincere regret that the mining fraternity of Nova Scotia learns of his departure from the Province.

Mr. P. A. Robbins was in Toronto during the last week of January.

The officers elected by the Cobalt Branch of the Canadian Mining Institute for the coming year were, Mr. Norman Fisher, Chairman; Mr. A. A. Cole, Secretary; and Messrs. Reinhardt, Neilly, and McVichie, Committee.

Mr. Herbert Carmichael, provincial assayer, recently visited the Marble Bay and other mines in the vicinity of Van Anda, Texada Island, British Columbia.

Mr. Clive White, mining engineer, in the employ of the Arizona Copper Company, at Morenci, Arizona, has been visiting his father, Mr. Oscar White, manager of the Slocan Star mine, near Sandon, Slocan district, B.C.

Mr. J. W. Bryant, for years with the Tyee Copper Company, has been at some of the Conrad mining properties in the Windy Arm district, Southern Yukon, during several weeks since, meeting the directors of the company named, when they were on the Pacific Coast late last year.

Mr. Thomas McGuickie has succeeded Mr. Thomas Graham as superintendent of Western Fuel Company's coal mines in Nanaimo district, Vancouver Island, B.C. Mr. Graham now has his headquarters, as chief inspector of mines for British Columbia, in Victoria, his office being in the Department of Mines there.

Mr. J. W. Powell, formerly mine manager for the International Coal and Coke Company, at Coleman, Alberta, and afterward for a short time at the Bellevue Mine of the West Canadian Collieries, Ltd., near Frank, Alberta, is now with the Columbia Coal and Coke Company at Coalmont, Tulameen, B. C.

Mr. J. E. McAllister, of New York, consulting engineer for the British Columbia Copper Company, Ltd., was in the Boundary district, B.C., recently.

Mr. Donald G. Forbes, at one time manager of the Silver Cup and other mines situated in the Lardeau district of British Columbia, has been examining the Hidden Creek copper mine, Observatory Inlet, B.C.

Mr. James Rutherford, of Victoria, B.C., who during the last two or three years has been obtaining, for Scottish capitalists, information relative to the mineral resources of the Peace River country and other interior districts of British Columbia, has gone to Scotland to personally report to his principals the results of his extended enquiries.

Mr. W. J. Elmendorf, general manager for the Portland Canal Mining Company, has returned to British Columbia, after having met Sir Donald Mann in Southern California, and discussed with him a proposed amalgamation of certain interests in mining properties situated in the Portland Canal mining division. Mr. Elmendorf, after a conference with the directors of his company, went up to Portland Canal.

THE PETROLOGY DEPARTMENT

By G. S. SCOTT

[This department has been arranged with a view to assisting those of our readers who are far removed from ordinary scientific facilities. The following article explains itself. Any further suggestions will be welcomed.]

Every mining engineer whose interest in ore deposits extends to the microscopic study of rocks is aware of the great delay in having thin sections prepared by the section makers in the States or in Germany. As a result microscopic examinations are often set aside as impracticable, even by those who most appreciate their value. And even if the sections could be had at once, it often happens that the engineer has neither the time nor the convenience required for their study. And moreover, not all have had the somewhat tedious training and experience which is necessary to make this study effective.

In view of these facts, arrangements have been made to have thin sections cut from rock or ore specimens sent to the **Canadian Mining Journal** for that purpose and the result of their study published in the following number. The examinations will be made by the writer, who first studied the examination of rocks with the microscope at the School of Mines in Freiberg, and for two years was Assistant in Mineralogy at the Toronto University. He has had considerable experience with the Porcupine and Swastika rocks.

In choosing samples of rock they should be selected away from fractures and rusty joints, and should be solid and free from cracks. Information regarding the occurrence of the samples greatly facilitates microscopic study and is always to be sent. For instance the locality, the depth from the surface, the distance from vein or dike or other mass of rock should never be omitted.

These facts are useful in making a microscopic examination and often save the observer who has only the handspecimen and section to judge from much trouble by indicating at the start the class of rock he has to deal with. This is specially the case with fine grained rocks.

No charge will be made for the study of the sections, but to cover the cost of their preparation which is done in the City on a day's notice 35c each will be required. This with the specimens and notes should be addressed to the Petrological Department, Canadian Mining Journal, Toronto.

No one will dispute the value of geology in mining. The day is past when a mine was considered a haphazard accumulation of ore whose development could be safely left to the miner. But it is not far past as regards the greater part of the mining profession; and many mining engineers are still intolerant of the introduction of matters concerning the rocks, and the genesis of the ores, into the practical questions of mining. Yet no proposition could be more self-evident than that all interferences regarding such important points as the extension and shape of the ore-body beyond where known, alternations in the character and richness of the origin and history of the deposit concerned, and that the origin and history of a deposit concerned, and that properly planned and it should be equally apparent geological. But this blindness is more conspicuous among the operators. How common it is to see a company that has acquired a prospect or a mine, acting as though the only thing to do were to send out the necessary number of labourers to load the ore on the cars! It might be expected that ordinary prudence would manifest to them the advisability, not to say necessity, of first determining what they had in their mine and how it was distributed, so that development could be properly planned. It should be equally apparent that a problem of such essentials to success should be entrusted to a man with the training and experience requisite to decipher the only evidence bearing on the question,—namely, that presented by the ores and the associated rocks. The engineer familiar merely with extraction, treatment, and incidental matters is here out of his place. From lack of acquaintance with, and appreciation of the subject, he must necessarily limit himself to statements of little significance, which are usually expressed in the time-honoured and hackneyed terms of the prospectus.

No branch of geology is of more importance in the investigation of ore deposits than that concerned with rocks. And in the study of rocks (petrography) no method of observation can be compared for utility with the method of examing rocks with the mircoscope (petrology). No person engaged in working out the geology of a mine can afford to ignore its unique and lavish assistance. So far as rocks are concerned, this is specially true of Canada where crystalline schists are predominant. These rocks (gneisses, schists, phyllites, many greenstones, etc.) were a sealed book, until towards the end of last century the geologists interested in these puzzling rocks discovered in the microscope an unexpected but most capable ally. Considering what an enigma the crystalline schists were at that time, the subsequent progress of knowledge is nothing short of marvellous. The microscope is doing for the schistose rocks, with which many ores are generally related, what palaeontology has already done for the more superficial strata of the earth's crust.

The essential part played by geology and petrology in mining has been treated above only in a very general way. It is a subject as fascinating as it is helpful and it is hoped to continue it in future articles. Some of these will deal in detail with particular cases, preference being given to those that best exemplify the practical value of the microscope.

G.S.S.

ANNUAL REPORT OF THE COAL MINES BRANCH, ALBERTA

During the year several changes were made in the staff of inspectors. In March Mr. Robert Livingstone resigned his position as Provincial Inspector of Mines to accept a position with the Alberta Railway & Immigration Co., at Lethbridge, as superintendent of their mines, Mr. John T. Stirling being appointed provincial inspector and Mr. Elijah Heathcote, who held the position of mine superintendent with the Crows Nest Pass Coal Co., at their Coal Creek mines, was appointed district inspector of mines with headquarters at Calgary.

In June Mr. A. R. Wilson resigned his position as district inspector of mines at Lethbridge, and Mr. John W. Powell, who held the position of mine superintendent with the McGillivray Creek Coal & Coke Co. at Coleman, was appointed as his successor.

In September, owing to the increase in the number of mines operating in the province, it was decided to appoint another district inspector, and consequently a rearrangement of districts was made necessary. Mr. Elijah Heathcote was appointed district inspector for the district west of Macleod, with headquarters at Macleod. Mr. John W. Powell was transferred from Lethbridge to Calgary District, which is the district east and west of Calgary, south to Okotoks, and north to Wetaskiwin, and Mr. Andrew N. Scott was appointed district inspector with headquarters at Lethbridge. The Lethbridge district includes the district from Kipp east to Medicine Hat and from the south boundary of the province north to Reid Hill.

From the following comparison of outputs for the last few years, it will be seen that a steady development has been taking place in the coal mining industry in the province. The year 1910 shows an increase in output of 862,428 tons over the year 1909.

Year.	Output in tons for N.W.T. (Alberta and Saskatchewan.)	Output in tons Alberta.
1901	346,649	.....
1902	510,674	.....
1903	622,939	.....
1904	782,931	.....
1905	.....	811,223
1906	.....	1,385,000
1907	.....	1,834,745
1908	.....	1,845,000
1909	.....	2,174,329
1910	.....	3,036,757

The above figures show that there has been an increase of 39.66 per cent. over the 1909 output.

CLASSIFICATION OF OUTPUT OF COAL IN ALBERTA DURING THE YEAR 1910.

	Tons.		Tons.
Lignite coal	878,011	Coal used in coke production	196,249
Bituminous coal	1,896,961	Coke produced	121,578
Anthracite coal	261,785	Briquettes produced	108,996

The following summary shows the total sales of coke, briquettes and coal of the Province:

	Bitu'nous.	An'cite.	Lignite.	Briquettes.	Coke.
Sold for consumption in Alberta	1,291,721	40,091	438,781	89,383	136
Sold for consumption in other provinces	124,274	43,110	317,959	19,387	70,297
Sold for export to the United States	215,976	758	27,397	44	51,144
Total sales	1,631,971	83,959	784,137	108,814	121,577

The following table shows the classification of persons employed above and below ground in the bituminous, anthracite and lignite fields:

AVERAGE NUMBER EMPLOYED.

	Bituminous.		Anthracite.		Lignite.		Total	
Character of Labour.	Above.	Below.	Above.	Below.	Above.	Below.	Above.	Below.
Supervision and clerical assistance	70	64	11	11	68	94	149	169
Miners and helpers	..	1341	..	177	..	1264	..	2782
Mechanics or skilled labour	233	47	35	..	160	14	428	61
Other employees	602	624	146	150	403	304	1151	1078
Total	905	2076	192	338	631	1676	1728	4090

SUMMARY OF STATISTICS.

Number of mines at present in operation	154
Number of new mines opened in 1910	42
Number of mines abandoned in 1910	7
Number of tons of coal mined	3,036,757
Number of tons of coke produced	196,249
Number of tons of briquettes produced	108,996
Average number of persons employed inside mines	4,090
Average number of persons employed outside mines	1,728
Number of persons employed inside the mines during December, 1910	4,714
Number of persons employed outside the mines during December, 1910	1,808
Number of separate accidents causing loss of life	29
Number of deaths caused by accidents inside the mines	59
Number of deaths caused by accidents outside the mines	2
Number of non-fatal accidents inside the mines	87
Number of non-fatal accidents outside the mines	11
Number of mine manager's certificates issued	9
Number of pit boss certificates issued	12
Number of fire boss certificates issued	38

MINES ABANDONED DURING 1910.

Mine No. 103.—Operated by Simon Downie & Son, Carstairs, section 19, township 29, range 5w5.

Mine No. 109.—Operated by Harper Coal Co., Edmonton, River Lot 22.

Mine No. 125.—Operated by Ketchum Coal Co., Edmonton, northwest quarter of section 7, township 53, range 23w4.

Mine No. 176.—Operated by Ashworth Townsley, Magrath, section 2, township 7, range 2w4.

Mine No. 190.—Operated by R. B. Durrant, Livingstone, northwest quarter of section 36, township 8, range 2w5.

Mine No. 206.—Operated by Burdett City Coal Co., Burdett, section 23, township 10, range 12w4.

Mine No. 230.—Operated by R. W. K. Cousins, Cochrane, southeast quarter of section 6, township 26, range 4w5.

EXTRACTS FROM INSPECTOR'S REPORT.

John Stocks, Esq., Deputy Minister of Public Works, Edmonton, Alta.

Sir,—As Provincial Inspector of Mines, I have the honour to submit herewith my annual report for the year ending December 31, 1910.

Considerable development has taken place in the coal mining industry in the province, in both the lignite and bituminous fields, but more especially in the bituminous field. A number of new mines have been opened up, and while a large percentage of them are not yet large producers it is expected that during the year 1911 there will be a still greater activity shown in the coal mining industry.

In the Lethbridge District the Alberta Railway & Irrigation Co., Ltd., has commenced development of their No. 6 mine on a large scale. The Diamond Coal Co. is also pushing ahead with development work and have made additions to its plant. The Lethbridge Collieries, Ltd., has sunk two shafts and is equipping for an output of about 2,000 tons per day. Shafts are also being sunk by the Chinook Coal Co. in this district.

In the Taber District considerable development has taken place, although the majority of the mines are being operated on a small scale. Coal cutting machinery is being largely adopted in this field, thus allowing a larger output to be produced with the same number of persons.

In the Crows Nest Pass District a large development has also taken place, and although there have been no new mines opened up the output from this district has increased considerably. The Leitheh Collieries, Ltd., is carrying on a large development in its No. 2 North

Mine and is erecting one hundred coke ovens and a washer. At Blairmore a new mine opened up by the West Canadian Collieries, Ltd., is also being rapidly developed. The McGillivray Creek Coal & Coke Co., Ltd., has completed the installation of a new tipple and plant. The West Canadian Collieries, Ltd., has completed the installation of a new tipple and electric machinery at its Bellevue mine. The Davenport Coal Co. has also been installing a tipple and plant at its mine opened up last year at Burmis.

In the Pincher Creek District the Western Coal & Coke Co., Ltd., is employing sixty men and is developing its mine so as to be able to handle a large output when they get railway facilities.

Considerable activity has taken place in the district west of Edmonton, five companies have been mining on their respective properties during 1910, and it is expected that as soon as railway connections are made with these different properties a large quantity of coal will be produced. The following is a summary of development work which has taken place at the different mines in the various districts during the past year:

[Editor's Note:—Only a few of the more important mines are noted here.]

CALGARY DISTRICT.

Bankhead Mines, Ltd., Bankhead.

Two 7 in. x 14 in. compressed air locomotives, one surface condenser with 2,000 sq. ft. of cooling surface and one L. P. air compressor have been installed. A tunnel is being driven across the measures. This tunnel has been driven a distance of 3,000 feet. Another rock tunnel is being driven, which will be used as a haulage road from Nos. 4, 5 and 6 seams. The use of explosives is still being discontinued as far as possible, and where it is necessary to use an explosive only Monobel powder is being used. The use of this powder has added greatly to the safety of the mine and has also increased the percentage of lump coal produced.

Surface Plant, No. 2 Mine, H. W. McNeill Co., Ltd., Canmore, Alta.

The H. W. McNeill Co., Ltd., Canmore.

One 6 in. x 10 in. Porter compressed air locomotive has been installed at this mine. A slope is being sunk from the surface to the Sedlock seam for a return airway for No. 1 mine. The airways in both Nos. 1 and 2 mines have been enlarged and re-timbered. A tunnel is being driven in No. 1 mine from No. 1 seam to intercept No. 3 seam.

CARBON AND THREE HILLS DISTRICT.

There are ten mines operating in the Carbon and Three Hills District, all of which are being worked on a small scale owing to the lack of transportation facilities; the amount of coal produced being regulated entirely by the local demand. This coal is of an excellent quality for domestic use. The seams are easily accessible, lying practically horizontal and overlaid by shale and sandstone which forms a fairly good roof. With the coming of the railway, which it is expected will be built through this part of the country during the present year, a largely increased output is to be expected. Preparations are being made in this district for the installation of machinery at various mines so that they will be in a position to produce a fairly large output when the railway is completed.

Surface Plant of Canada West Coal Co., Ltd., Taber, Alta.

Only one or two mines are being operated in the High River District and on a very small scale. The coal is of a semi-bituminous nature and of good quality, and varies from five feet to eight feet in thickness, but owing to the lack of transportation facilities very little is being done in this district. Machinery has been installed by the Black Diamond Collieries near Okotoks, and preparations are being made to sink a deeper shaft and do a large amount of development work underground.

Surface Plant, Nos. 5 and 6 Mines, Lethbridge, Alta.

A number of small mines have also been opened up along the Wetaskiwin and Lacombe branches, but as the output of these mines is entirely regulated by local demand, they only work for about six months in the year. In the Fieldholme District a mine has been opened up on sections 6 and 7, township 23, range 14, west of the 4th meridian. The coal seam is 5 ft. 6 in. thick and makes a very good domestic coal. Considerable prospecting has also been done along the north side of the Red Deer River and quite a number of parties have located coal lands in this district.

EDMONTON DISTRICT.

In the Edmonton District a number of mines have been opened up and some of them are becoming fairly large producers. At Clover Bar a number of these mines have now got transportation facilities on the railway and are largely increasing their output.

Edmonton Standard Coal Co., Ltd., Edmonton.

A considerable amount of development has taken place

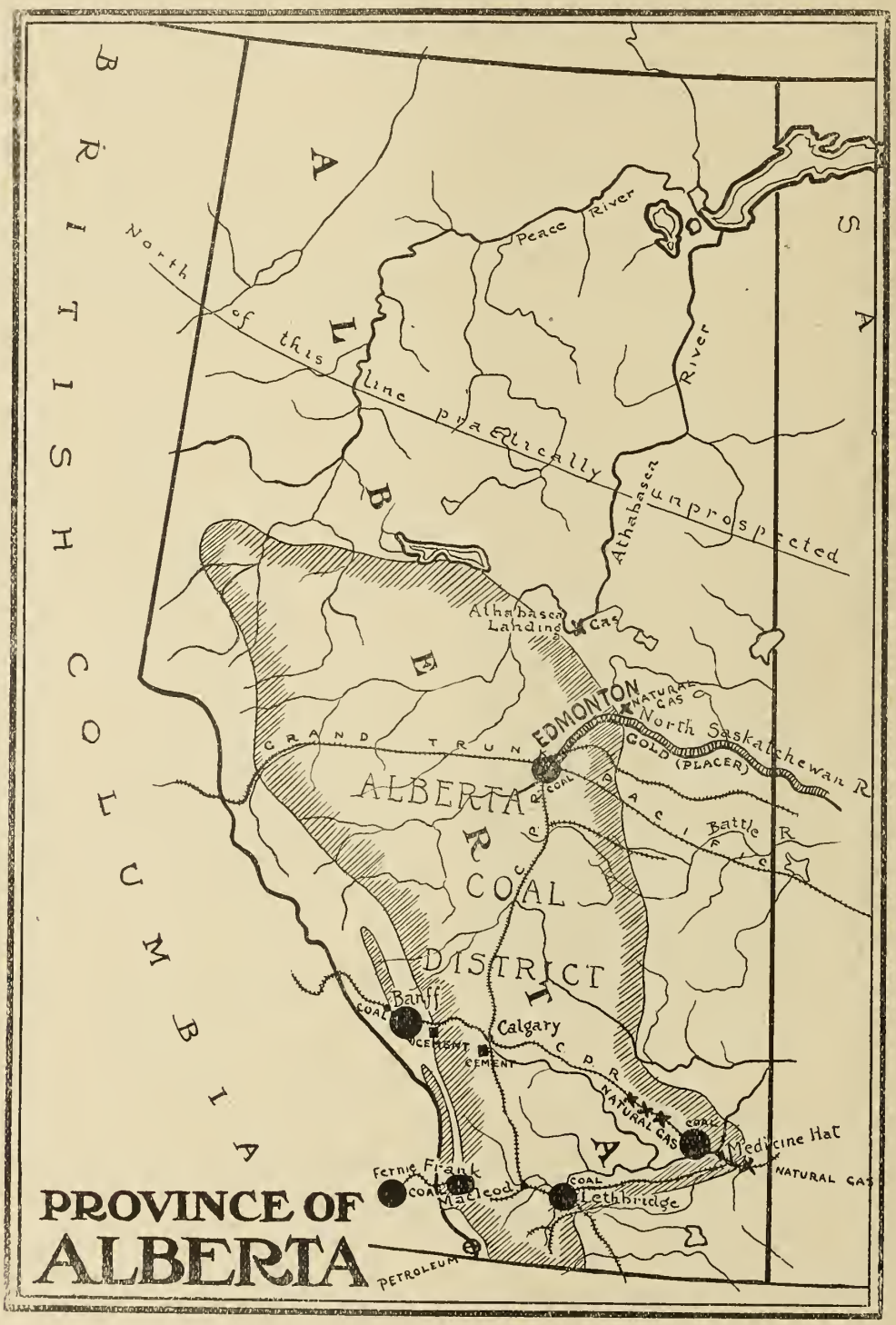
at this mine and a Sheldon fan capable of producing 40,000 cubic feet of air per minute has been installed.

Pacific Pass Coal Fields, Ltd., Edmonton.

This company controls coal claims of about 50,000 acres extending in a northwesterly direction from the forks of Big Pembina and Little Pembina Rivers, about

to handle a large output when the Grand Trunk Pacific branch line has been built in to the property from Mile 16.

A mine is being opened up by the Wabamun Coal Co. at Lake Wabamun and a shaft being sunk and it is expected mining operations will be commenced in the early part of this year.



28 miles. Several seams are outcropping all along the property, the two largest being about 17 feet thick and separated by 140 feet. The strata where No. 1 mine is being developed are pitching about 25 degrees in a southerly direction. The coal is bituminous and of good quality for steam purposes. Preparations are being made

At the crossing of the Pembina River the Coal can be seen outcropping on the river bank. Besides these outcroppings on the river a large amount of drilling has been done on the property of the Pembina Coal Co., Ltd. Shafts have also been sunk on this property and the quantity and quality of the coal proved. It is a lig-

nite coal and very suitable for domestic use. The next point where coal is found is at Wolfe Creek, but as it does not appear to be of workable thickness very little has been done at this point. Following the MacLeod River westward large beds of sandstone of the lower Larmie series are passed to Mile 142.

Further west at the headwaters of the Embaras River, a large amount of development work was done during the summer of 1910 by the Yellowhead Pass Coal & Coke Co., Ltd., and several seams of a semi-bituminous coal, varying in thickness from two feet to twenty feet have been proved. These seams dip at an angle of about fifty degrees. Four slopes have been driven across the measures in the bottom bench of the twenty-foot seam at an angle of about twenty-five degrees. These seams are separatd by carbonaceous shales and sandstone which form a very good roof. This company has installed the following machinery on its property during the year: Two 80 h.p. boilers ,one 60 h.p. hoist, one 20 h.p. engine for machine shop purposes, four Fairbanks Morse pumps of a capacity of 250 gallons per minute. Wolfe lamps have also been installed and a lamp-house built.

During the summer of 1910 the property owned by the Brazeau Collieries, Ltd., has been prospected and five seams of coal have been proved. Tunnels have been driven to the different seams on the south side of the river. It is expected that much further development will take place on this property during the year 1911.

CROWS NEST PASS DISTRICT.

International Coal & Coke Co., Ltd., Coleman.

The main entries in this mine have been enlarged and retimbered. Five compound air locomotives have been installed, also 100 two-ton mine cars, two 72 in. x 18 ft. return tubular boilers, ash pump and electric motor. The locomotive sheds have also been extended and the engine, boiler and fan have been removed from No. 98 chute No. 2 seam to Yorke Creek.

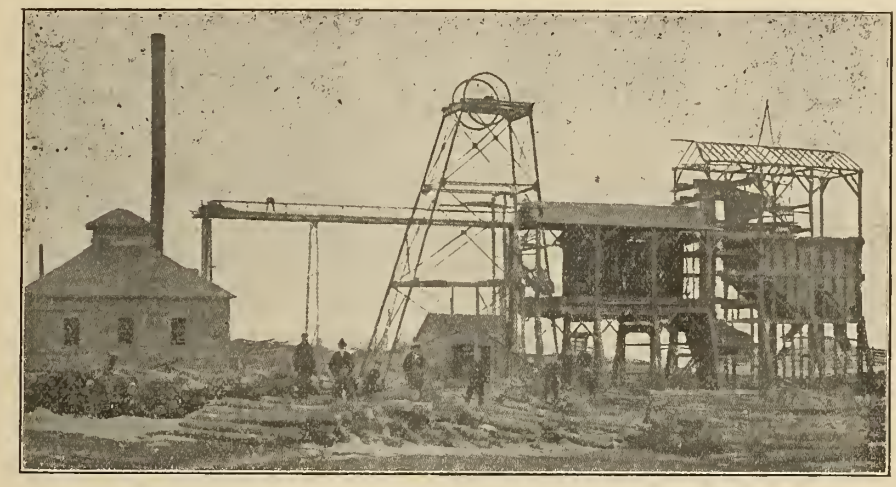
McGillivray Creek Coal & Coke Co., Ltd., Coleman.

This property is situated at Carbondale west of the Town of Coleman, the seams of coal being a continuation of the Coleman seams. No. 2 seam is being worked. This seam is 12 feet thick. A slope is driven down on the pitch of the seam and from the bottom of the slope, north and south entries are driven, the main north entry being 1,793 feet and the main south entry 348 feet. One pump with a capacity of 150 gallons per minute has been installed, also one pump with a capacity of 200 gallons per minute, and one Sirrocco fan capable of producing 50,000 cubic feet of air per minute.

This company has also built a steel tipple with a capacity of 2,000 tons per day and installed 60 steel Watt mine cars with a capacity of four tons each. One machine shop 100 feet by 30 feet, built of stone and fully equipped. One power-house 80 ft. x 56 ft. built of stone and equipped with two 150 h.p. Waterous boilers and one 150 k.w. direct current generator direct-connected to engine. An outside electric haulage road 42-inch gauge, one and a half miles long connecting the mine and tipple and operated by two 100 h.p. electric motors of the Goodman type.

Blairmore Mine.

The following plant has been installed during the year 1910: One 150 h.p. boiler of 125 pounds steam pressure, one three-phase 75 k.w. generator, one transmission line, one Murphy fan four-foot in diameter electrically driven, one wash-house capable of accommodating 150 men and fitted with steel lockers and five shower baths, one concrete lamp-house and 150 Wolf lamps (these lamps are installed throughout the mine), one stable to accommodate 20 horses, one new tipple which includes creeper chain to haul cars, and Phillip's automatic cross-over dump with bar screens and picking tables, new railway sidings to accommodate 35 cars, one railroad Fairbank's steel scale of 100 tons, one assay office, a mine office and store, electric light system outside and incandescent lamps along main entry in mine.



Breckenridge and Lund Co.'s Plant at Lundbreck, Alta.

Bellevue Mine.

The installation for the Bellevue mine includes one wash-house capable of accommodating 300 men and fitted with steel lockers, and shower baths, one machine shop fitted with two lathes, one shaper, one radial drill press, one ordinary drill press, one pipe and bolt cutter, hack saw, grindstone and emery wheel, one steel tipple with a capacity of 2,000 tons in eight hours with an automatic dump, picking belt and box car loader, a new power-house fitted with four 150 h.p. Waterous boilers, feed pumps, one Rand four-stage air compressor, with a capacity of 746 cubic feet, pressure of air 1,200 pounds with compound steam cylinders, one Ridgway 150 k.w.

generator, one Sirrocco fan of 100,000 cubic fet capacity driven by direct current motor, one 50 k.w. alternator and three wire transmission line, one 6 ft. Murphy fan driven by electric motor, two compound air locomotives (cylinders 5½ in. x 11 in. x 10 in., weight 17,000 pounds), one compound air locomotive (cylinders 7 in. x 14 in. x 14 in., weight 19,000 pounds), to haul coal underground. The main entry has been laid with heavy steel. Concrete lamp-house, mine office, powder magazine, oil-house and new yard is laid out which adjoins the main line of the C. P. Ry. to facilitate the loading and handling of cars to and from the new steel tipple. Safety lamps of the Wolf type are installed throughout the mine.

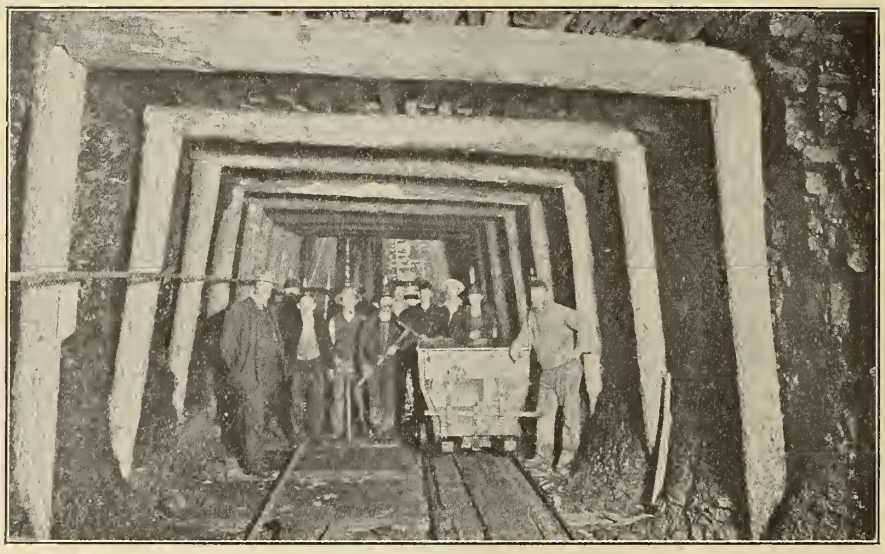
Lille Mine.

One electric light system around the coke oven plant. Safety lamps are installed in No. 1 mine, but open lights are still being used in Bear Valley North Mine.

volts driven by a non-condensing 15 in. x 14 in. engine; one alternating generator 75 k.w., 3 phase, 60 cycles, 2,300 voltage, which is installed to duplicate the first 2,300 volt machine; four Babcock and Wilcox water tube boilers, 250 h.p., each, 160 pounds steam pressure, steam header 12 in. diameter; 175 h.p., alternating motor has also been installed to drive the tipple machinery, also a motor to drive the saw mill. One 150 h.p. motor has been coupled to the ventilating fan at the old mine and is proving satisfactory. Hithertofore the fan was steam driven but good results were not obtained. A new electric hoist is being installed at the entrance of the old mine to supercede the steam driven hoist now in use. This hoist is for the purpose of hauling coal up the slope, the slope having been driven to attain a greater depth of working.

Maple Leaf Coal Co., Bellevue.

A new slope has been driven 400 feet down to attain a greater depth of working, and to prove the coal at a



Underground Workings of the Alberta Coal Mining Co., Cardiff, Alta.

Hillcrest Collieries, Ltd., Hillcrest.

This company is driving an incline across the pitch of the coal measures, on an inclination of nine degrees. The coal was prospected ahead of this incline with a slope driven to a depth of 300 feet on the true pitch of the measures. Outside the mine the company has built a new locomotive house for the railroad locomotive.

Canadian Coal Consolidated, Ltd., Frank.

This company is working the same seam of coal at the shaft and the old mine. In the shaft mine the breast system of mining coal was adopted; this system of mining consists in taking out the coal with 25 or 30 feet breast on a pitch of 86 degrees. This system, however, has been discontinued and the angle system adopted, the angles being driven on an inclination of 35 degrees across the pitch. The smelter entry is being opened up and will soon be on an operating basis.

A new power-house has been built at the shaft mine and equipped with one 500 k.w. alternating generator 3 phase, 60 cycles, 2,300 voltage. This generator is driven by a compound non-condensing engine 24 in. x 36 in. x 24 in., a simplex engine 8 in. x 8 in., dynamo 25 k.w. 125 volts, direct current; also to duplicate above; one alternator 100 k.w., 3 phase, 50 cycles, 500

lower level. This company has installed one 150 h.p. boiler, one 75 h.p. hoist for hoisting coal up the slope, one 150 ton track scales, one Sirrocco fan driven by electrical power with a capacity of 50,000 cubic feet of air per minute, one Robb high speed electric engine 125 h.p. with generator. A stable to accommodate 12 horses, with granary, has been built, also a boiler-house, power-house and lamp-house.

Leitch Collieries, Ltd., Passburg.

This company is working No. 1 mine south of the Canadian Pacific Railway of the Crows Nest Pass branch, but owing to the irregularities of the coal, development of the mine has been delayed. One mile east of the No. 1 mine south, the No. 2 mine north has been opened up. The main entry has been driven 2,200 feet in the No. 2 seam. At two points on the main entry rock cross cuts have been driven, one to the east and one to the west of the entry, for the purpose of proving Nos. 1, 3 and 4 seams, the coal in each seam proving of excellent quality with a good roof and pavement. Nos. 3 and 4 seams are being developed, and will soon be large producers.

A rock tunnel has been driven to the surface and connects with the main entry in No. 2 seam and is being

used as an air shaft. A fan is installed on the surface in connection with the rock tunnel to ventilate the mine. This fan is capable of producing upwards of 100,000 cubic feet of air per minute and is so arranged that it can be used either as a forcing or exhausting fan.

The entrance to the mine being some distance away from the tipple, an outside single rope system of haulage has been installed to run the loaded cars to the top of the tipple and bring back the empty cars. This haulage is capable of handling 3,000 tons of coal in ten hours. A new tipple has been erected together with coal pockets, shaking screens and picking table, capable of handling 2,000 tons of coal per day. A spur track from the Canadian Pacific Railway Crow's Nest branch, together with yards for holding one hundred cars has been laid.

A power-house providing room for four 150 h.p. boilers, engine room, machine shop and locomotive stalls, has been built. Also a coal washing plant of the Luhrig type constructed of wood with ten jigs for washing small coal for supplying the coke ovens. One hundred rectangular coke ovens are being built, sixty of which are completed.

Davenport Coal Co., Ltd., Burmis.

This company is operating the mine which was formerly operated by the East Crow's Nest Coal Co., Ltd.; east of the old mine a new gravel tunnel has been driven which opens up No. 5 seam. To the west of this tunnel a rock cross cut has been driven which proves Nos. 1, 2 and 3 seams. Nos. 2 and 5 seams are being worked, most of the coal being produced from No. 2 seam. From the west side of Burmis station on the Canadian Pacific Railway, Crow's Nest line, a spur track has been put in for the storage of cars, the cars being loaded under the tipple on this spur track.

One temporary tipple built of wood has been erected and plans are being prepared for a new steel tipple. From the top of the tipple a mine car track has been put down and graded to connect with the mine. An extensive plant is in course of construction, consisting of boilers, haulage engine and Sirrocco fan, to deal with an increased output, also a new wash-house. A blacksmith shop, store house, mine office and lamp-house have been erected. The development is being pushed ahead and it is intended to produce an output of 1,000 tons per day.

Galbraith Coal Co., Lundbreck.

A new slope has been driven on No. 2 seam to a depth of 250 feet, at which depth the slope was discontinued for the time being, and a main level driven 250 feet. The new slope was driven to attain a greater depth of working. A boiler house has been erected and a new boiler and hoisting engine installed.

Western Coal & Coke Co., Ltd., Pincher Creek.

The property of the Western Coal & Coke Co., Ltd., is situated 12 miles west of Pincher Creek and the mine is opened up by a tunnel driven 1,300 feet. At a point 850 feet from the entrance, a slope 7 ft. x 8 ft. is driven 400 feet. The main entry in now driven a distance of 2,968 feet, together with a counter entry. The main slope is driven a distance of 1,028 feet and has been widened and re-timbered 6 ft. x 10 ft. in the clear.

Across the valley of Beaver Creek a second opening was made in the same seam of coal. An entry has been driven a distance of 851 feet, and a raise 225 feet driven from it to the outcrop. A tunnel 8 ft. x 8 ft. is being driven through drift along the strike at a proper working elevation to meet the seam on end, the tunnel being driven a distance of 118 feet.

One 100 h. p. horizontal tubular boiler has been installed and four cottages built.

PINCHER CREEK DISTRICT.

There are a few small mines operating in the Pincher Creek District and one on the south fork. In the Pincher Creek District, A. D. McKinnon has opened up a small mine by driving a tunnel at water level from Mill Creek. On the south fork of the Old Man River the Fernie Syndicate owns coal lands and has driven small tunnels and done surface stripping, proving six seams of coal, four of which vary in thickness from 7 feet to 13 feet, and two vary in thickness from 8 inches to 3 feet. The seams are regular throughout and two of them are of excellent coking quality.

LETHBRIDGE DISTRICT.

Alberta Railway & Irrigation Co., Lethbridge.

The new plant which was in course of erection last year has now been practically completed. Steel head gear has been erected at the No. 5. shaft, the whole being encased in steel plates and fitted with an air lock. No wood whatever has been used in the construction, and this part of the plant is as nearly fireproof as possible. An Ottumwa box car loader has been completed and is now in operation. All steam pipes have been covered with asbestos. A three-stage turbine pump with a capacity of 275 gallons per minute against a head of 350 feet has been added to the plant at the river. This pump is electrically driven. Foundations have been laid for another battery of Babcock & Wilcox boilers, and steel plate storage bins with a capacity of 300 tons have been built. A conveyor 200 feet long has been installed to carry the slack from the shaking screens to the storage bins.

An engine of 50 h.p. has been installed so that it is now possible to do the shunting of the railway cars without the aid of the locomotive. Shoes 8 ft. long have been placed on either side of the cages to replace the small shoes. These shoes are giving much better satisfaction and have prevented to a great extent the cutting up of the guides. A large up-to-date wash-house has been erected with lockers and shower baths. An emergency hospital is also provided. Blacksmith, carpenter and machine shops are in course of conctruction and will be equipped with up-to-date machinery. Systems of fire protection have been installed both below and above ground. Above ground five hydrants and twelve lengths of hose pipe are provided and can be connected with the boiler feed pumps. A 2½ inch pipe has been brought from the water tank on the surface, and seven hydrants and five lengths of hose pipe installed underground. Preparations are being made for installing an endless rope haulage underground. The development work of the No. 6 mine has been pushed rapidly ahead until the output has now reached about 800 tons per day. This development work has been considerably delayed as numerous faults have been encountered.

(To be continued.)

MINING EXAMINATIONS, PROVINCE OF ALBERTA

Examinations held by the Albertan Department of Public Works

Examinations for fire boss cretificates was held at Banff and Frank on May 18th, at which twenty-nine candidates presented themselves for examination, seventeen of whom passed, and the regular examinations for mine managers, pit bosses and fire bosses were held at Banff, Frank and Edmonton on October 12th, 13th and 14th. At the latter examinations one hundred and eleven candidates presented themselves for examination, forty-five of whom passed, as follows: Managers, thirty-five sat for examination, eleven passed. Pit bosses, twenty-nine sat for examination, thirteen passed. Fire bosses, forty-seven sat for examination, twenty-one passed.

The number of candidates who presented themselves for examination during the year 1910 shows a considerable increase over the previous year, and with the steadily increasing number of mine officials qualifying each year there should soon be no difficulty in securing a sufficient number of certificated persons to fill all official positions at the mines.

During the year sixty-two provisional pit boss certificates and fourteen provisional fire boss certificates were granted to different persons until they had an opportunity of obtaining certificates by examination:

The following are the questions set at the examinations held at Banff, Frank and Edmonton on October 12th, 13th and 14th, 1910:

Mine Manager's Examination.

Paper No. 1. Time allowed, two hours.
The value attached to each question is given in parenthesis. Candidates must obtain 70 per cent. of the allotted marks to pass.

COAL MINES ACT.

1. What are the provisions of The Coal Mines Act relating to the employment of boys in or about a mine? (12)

2. State fully what returns and notices are required by The Coal Mines Act to be sent to the Minister of Public Works and to the Inspector of Mines, and what books are required to be kept at the mine. (12)

3. What provisions are made in The Coal Mines Act for the establishment and modification of "Special Rules"? (12)

4. State fully the provisions of The Coal Mines Act dealing with the reporting of accidents in or about a mine, and state what information is required when reporting an accident. (11)

5. What are the requirements of The Coal Mines Act as to plans of workings? (8)

6. What are the provisions of The Coal Mines Act regarding the use and handling of explosives in a mine? (17)

7. Give the provisions of the "Act to Amend The Coal Mines Act for the Purpose of Limiting Hours of Work below Ground." (12)

8. What are the provisions of The Coal Mines Act regarding winding engines, machinery and steam boiler fittings? (8)

9. What is the interpretation of "mine" as given by The Coal Mines Act? (8)

Mine Manager's Examination.

Paper No. 2. Time allowed, two and a half hours.
The value attached to each question is given in parenthesis. Candidates must obtain 70 per cent. of the allotted marks to pass.

GASES AND SHOT-FIRING.

1. Discuss briefly the known mine gases under the following heads: Origin, Composition, Probable Locality, Mode of Detection, Effects. (17)

2. Mention the several explosives used in mines in Alberta. Describe their properties and peculiar characteristics. Show their adaptation for certain results in blasting operations, and explain the dangers attending the use of each. (8)

3. State fully what should be the qualifications of a perfect safety lamp. In what ways may a safety lamp cause an explosion? (12)

4. Explain the law of the "diffusion of gases" and its effect on their behaviour in mines. (10)

5. What is the influence of coal dust on the safety of a mine? In what mines, and what parts of them is it most dangerous? And in what different ways can the dangers be dealt with? Mention any other practical advantages that can be obtained by removing the dust? (10)

6. Which do you consider the best type of safety lamp to be used by a miner? Give a description and sketch it, with your reasons for preferring it. (12)

7. Does the presence of carbon-dioxide affect the inflammability of fire damp? If so, how? State fully. (7)

8. What are the chief causes of mis-shots in electric blasting? Describe the "high tension" and "low tension" systems of electrical shot-firing respectively. (12)

9. If in a fiery mine the quantity of air passing through the return is 115,000 cubic feet per minute, and contains 4 per cent. of fire damp when the barometer registers 30, what quantity of fire damp is given off in the mine? What is the least decrease of the quantity of air that will render the air in the return explosive? What increase of gas will render the return air explosive? (12)

Mine Manager's Examination.

Paper No. 3. Time allowed, three and one-half hours.
The value attached to each question is given in parenthesis. Candidates must obtain 70 per cent. of the allotted marks to pass.

VENTILATION.

Coefficient of friction .00000002.

1. What are the advantages of splitting the air, and by what causes is the number of splits limited? (9)

2. How is ventilation produced? Describe briefly the different modes, natural and artificial. State which is best, and why you consider it to be so. (8)

3. There are three airways in a mine, viz.: (a) 3,000 ft. x 6 ft. x 5 ft.; (b) 4,000 ft. x 6 ft. x 6 ft.; (c) 2,000

ft. x 5 ft. x 5 ft. The total quantity of air passing in the three airways is 50,000 cubic feet per minute. What is the quantity passing along each airway? (15)

4. Ventilate the given plan, having due regard to the requirements of haulage. Criticize the plan, and point out anything you consider to be defective. (20)

5. A certain quantity of gas occupies 25,073 cubic feet with the barometer reading 30.7 inches. How will this volume be effected if the barometer falls to 28.9 inches? (6)

6. How many cubic feet of air per minute would be circulated through a mine whose airway is 1,875 feet long, to insure a circulation of 70,000 when the airway has been extended to a length of 4,800 feet? (7)

7. If a ventilating fan is running at 40 revolutions per minute with 1.5 inches of W.G. and it be altered so that W.G. reads 2.6 inches, what will be the fan speed? (8)

8. Define the terms "Coefficient of friction," "Ventilating pressure," "Water Gauge," and "Resistance of Air." (10)

9. What precautions should be taken in the matter of safety lamps? Trace lamp from the cleaning and trimming in the lamp-house to the use of it at the face, and show how it should be treated in a dangerous mine. (7)

10. What will be the height of the motive column in a case where the depth of the downcast is 300 feet, and the temperature of the downcast is 32 degrees F. and the temperature of the upcast 48 degrees F.? (10)

Mine Manager's Examination.

Paper No. 4. Time allowed, three and one-half hours. The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

PRACTICAL WORK.

1. Are mine fires more likely to occur in one mine than in another, and if so, why? In the event of a mine fire, what precautions would you take to protect the workmen engaged in extinguishing the same? (10)

2. Give a short description of two methods of working a coal seam six feet thick, with tender roof and pavement, and pitching at an inclination of 35. Explain fully the circumstances under which each system is most suitable. (15)

3. Describe the method of driving and timbering rapidly a large haulage road, with tender roof and pavement, showing how the alignment and gradient are kept. (9)

4. State your views as to the causes of explosions in mines, and what precautions you would adopt to prevent them. (10)

5. For what purpose is electricity used in the operation of coal mining? Name the four electrical units in common use and define each. Name the dangers in the use of electricity under ground that might be avoided by ordinary care. (10)

6. Describe with sketch how, and with what material you would build a dam in solid strata, to withstand a head of 580 feet of water. Give dimensions. (8)

7. Describe, with sketches, how you would lay out a shaft bottom, to handle an output of 800 tons per day of 8 hours. (10)

8. Two shafts are to be sunk to a depth of 500 feet, the one a downcast, and the other an upcast. The daily output of coal is 800 tons, and the water 300 gallons per minute from the bottom. Sketch and describe the forms and dimensions you would recommend for each shaft, giving details of lining, midwall, slides, etc. (11)

9. What are the causes of sudden outbursts of gas in coal mines, and what in your opinion should be done to prevent them? Explain fully. (9)

10. What are the advantages and disadvantages in the use of the different kinds of coal cutting machines, keeping in view health, safety and economy? Answer fully. (8)

Mine Manager's Examination.

Paper No. 5. Time allowed, three and one-half hours. The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

MACHINERY.

1. What is the effect of incrustation forming in a boiler, and how would you prevent it? Are there any dangers likely to arise from it? If so, state them. Mention some causes of priming in connection with steam boilers, and the methods you would adopt to prevent or diminish it. (8)

2. What is meant by "initial," "mean," "terminal" and "back pressure of steam?" (5)

3. What would be the size of a cylinder of a single engine geared in the ratio of 1 to 6 to a drum 5 feet in diameter in order to hoist a weight of 4,000 pounds from a shaft 85 feet deep in 45 seconds? (To allow for friction add one-fourth of the load to be hoisted: assume a mean effective steam pressure in the cylinder of 50 pounds per square inch.) (10)

4. Describe the working action of a forcing pump. (6)

5. Recognizing the losses arising in the use of compressed air, state generally what arrangements you would adopt with a view to obtaining the best results. (10)

6. How would you proceed to determine the horsepower of an engine from a diagram or diagrams taken by an indicator? Do you require one or more diagrams? ( )

7. In deep winding shafts what are the best modes of counteracting the weight of the winding rope, and what methods have been adopted for reducing the excessive strain on the rope at the point of starting? (8)

8. Give a short account of two principal methods of mechanical haulage adopted underground, including the advantages and disadvantages peculiar to each. (12)

9. What requirements for the preservation of winding ropes are necessary in the interests of safety? What kind and size of winding rope would you use to hoist a load of 5,000 pounds? (8)

10. What is meant by "electro-motive force," "ampere," "volt"? What is a horse-power generally taken at in dealing with electrical energy? (8)

11. What pressure per square inch will an air compressing engine produce under the following circumstances, viz.: Two steam cylinders each 30 inches in diameter, 7-foot stroke, steam pressure 45 pounds per square inch, one air cylinder 36 inches in diameter, and one 20 inches in diameter? (10)

12. Compare the use of compressed air and electricity in coal mining, giving the advantages and disadvantages of each. (10)

(To be continued.)

THE LATE MR. JOHN B. HOBSON.

BY E. JACOBS, VICTORIA, B.C.

On the morning of Tuesday, January 9, John B. Hobson, long, well, and favourably known in British Columbia, and in earlier years in California, died at his residence, "Gisburn," Rockland avenue, Victoria, B. C. On the following Saturday morning his body was sent by the S.S. "Iroquois," to Seattle, Washington, whence it was taken by rail to San Francisco, California, for burial in the vicinity of that city. Upon Mr. Robert Hobson, eldest son of the deceased mining engineer, devolved the sad duty of making the journey to California, where, with his uncle, Mr. H. B. Hobson, he paid his last respects to the remains of his father.

The late Mr. Hobson was born in Ireland. As his age is stated to have been 67 years, the year of his birth must have been 1844. Not much information is at present available concerning his younger days, save what is contained in the first part of the following notice of him, which was printed in the "British Columbia Mining Record" of February, 1903, probably prepared by the then editor (Mr. H. Mortimer-Lamb), and this at a time when the subject of it was taking an active and prominent part in the organization of the Provincial Mining Association, which was established in that month. The "Mining Record" said:

His Career in California.

"Mr. John B. Hobson is a native of Ireland, where his father was for many years engaged as manager of coal mines. In 1848, Mr. Hobson, with his parents, arrived in New York, and resided there until 1857, in which latter year the family removed to California, where Mr. Robson studied metallurgy and mining engineering and became closely identified with many of the large quartz and deep gravel mining enterprises in the central part of that State.

"In the fall of 1891 Mr. Hobson, associated with the Hon. Jacob H. Neff (the present Lieut.-Governor of California); Mr. D. W. Lubeck, of the Placer County Bank, and other gentlemen, met at Auburn and formulated plans for the organization of the California Miners' Association, which has done so much to place the mining industry there on a prosperous footing.

"Prior to the organization of the California Miners' Association, Mr. Hobson published in San Francisco the "Mining and Industrial Advocate," for the purpose of calling public attention to the necessity for uniting in an effort to secure at the hands of the National and State administrations the legislation necessary to improve the conditions of the mining industry and to remove the many disadvantages under which the miners were labouring. Immediately upon the organization of the California Association, that body selected Mr. Hobson as one of the legislative committee, where he had associated with him the Hon. Niles Searles, ex-Chief Justice of the Supreme Court of California; the Hon. J. K. Luttrell, and others. They were sent to Washington, D. C., to draft a bill and urge its adoption by Congress. They did this so effectively that Congressman Caminette introduced the desired measure, which was finally passed and resulted in the complete rehabilitation of an industry which has since produced from $10,000,000 to $15,000,000 annually.

Turns Attention to Cariboo, B.C.

"In 1892 Mr. Hobson was invited by Sir Wm. Van Horne and the directorate of the Canadian Pacific Railway Company to visit British Columbia and explore the vast areas of auriferous deep gravels in the northern districts of the province and determine their value. As a result of his investigations, the Consolidated Cariboo Hydraulic Mining Co. and the Horsefly Hydraulic Mining Co. were formed, to take up the large properties here, the equipment and opening of which for production on a very extensive scale has been in progress for the last ten years.

"Prior to Mr. Hobson's departure for British Columbia, he had been associated for many years with the Geological Department of the California State Mining Bureau, and the results of his field work may be seen in the annual reports of that institution.

"Shortly after Mr. Hobson commenced mining operations in British Columbia, he encountered many of the difficult and objectionable features of the Mineral Placer Mining, and Water Clauses Acts, and for the last seven years he has been urging on Parliament the necessity for adopting such remedial legislation as would result in throwing the country open for exploration by individual miners, prospectors, and investors in such a manner as would encourage the settlement of the province and the development of its mineral resources."

Promotes Provincial Mining Association.

Before making other quotations relating to the late Mr. Hobson, it may be mentioned, in passing, that he was strongly supported for election as the first president of the Provincial Mining Association of British Columbia. There were more than 200 delegates present, and among these were many who urged Mr. Hobson's election. One said: "Mr. Hobson was one of those gentlemen who met originally to organize the California Miners' Association; he has ever since been an active member of it, and he has given our association the benefit of his experience and connection with that association. He has been the leading spirit in getting up this organization. I need not say that he does not at all covet any such position as this, and he has repeatedly stated so to many of us." Another added: "Had it not been for the energy of Mr. Hobson in organizing this association and calling together this convention, there would not have been, this year at least, any such gathering as we have had in Victoria the past week. He has done it absolutely without any object except that of bettering the conditions of the mining industry in this country, and in giving him this position it is no more than he is justly entitled to." However, it was eventually decided that it would be in the best interests of the new association to have as its president one who was not so strong an advocate of the claims of any particular branch of the mining industry as Mr. Hobson, from his extensive connection with placer mining, necessarily was, so a president not actively engaged in mining was chosen instead.

It may be no other suitable opportunity will present itself to recall what Mr. Hobson's views were in connection with the Provincial Mining Association he so materially assisted in organizing. Early in the pro-

ceedings of the convention he said, on February 16, 1903:

"I congratulate you, gentlemen, upon the favourable auspices under which you meet here to-day. Your prompt response to the call for a Miners' Convention proves conclusively that you are here to make a united and determined effort to better the conditions surrounding the mining industry, and to encourage the development of the vast mineral resources of the province.

"You are here to-day for the purpose of organizing a Provincial Mining Association, the object of which will be to encourage and foster the development of the mining industry, which must be considered the paramount industry of the province.

"The association, as I understand it, will not be a technical one, concerning itself with the science and practice of mining; nor a commercial and financial one, concerning itself with mining properties and investments; nor should it have anything to do with labour problems, nor interfere in any way with labour unions. Most of the mining organizations of the world have been formed for these and similar purposes (with the exception of the California Miners' Association, which has attained such wonderful success).

"This association from its beginning should make united efforts to secure legislation in behalf of the whole mining industry, and otherwise promote and protect the legal rights and privileges of miners, prospectors, mine owners, and mining investors. In all other matters of general importance, it should represent the whole mining interests, and express its policy, and this will be the second association organized in the world in the general interest of the mining industry. It should represent the concentrated influence of the population of the province directly and indirectly interested in the industry of mining. Its influence will be strongly felt in the halls of Parliament and the Provincial Legislature.

"Through being composed of men representative of the best ability and character in the British Columbia mining field, by adopting conservative measures and conciliatory methods, and working with energy to secure its ends, it will attract and maintain the confidence and respect of the people. It will do much to improve the present depressed condition of the industry and restore confidence to the legitimate mining investor, who is required to assist in placing the mineral industry of the province on the basis for large and profitable production.

"I feel confident, gentlemen, that the association you will organize to-day will maintain its vitality so long as there is mining done in British Columbia. The success of the association will depend on the basis upon which it will be organized, so I urge upon you to see to it that you organize upon a carefully laid foundation. If this be done, the association cannot fail to be a grand success, and general prosperity will surely result."

This is not the time nor place in which to attempt to explain why Mr. Hobson's worthy aspirations in this direction were later woefully disappointed; only the simple fact may here be stated, that the Provincial Mining Association, while it first bade fair to be of material service to the mining industry as a whole, in the course of two or three years failed utterly, to the great regret of Mr. Hobson, who was not only grievously disappointed, but was also at pecuniary loss, for he personally paid, to the extent of nearly $1,000, liabilities it had incurred while in existence.

Other Phases of Activity.

Turning now to other phases of Mr. Hobson's activities, the following information has been gleaned from various sources:

Among the many useful achievements that marked his connection with mining in California, was that of having invented a deflecting nozzle, for use in hydraulic mining. This is stated to have been known as "Hobson's Improvement," and to have been of great service to hydraulic miners.

In regard to his contributions to literature on placer mining subjects—it is much to be regretted that of late years he wrote little if anything to place on record his extensive knowledge of, and experience in connection with hydraulic and other placer mining methods and results. In the "Year Book of British Columbia, 1907," reference is made to a paper on "The Auriferous Gravels of British Columbia," which is shown to have appeared in the Journal of the G. M. A. of Quebec, Vol. II., p. 177, 1894-5. It is worthy of note here that when, in 1907-8, Mr. John Hays Hammond (who is stated to have obtained some of his early mining experiences under Mr. Hobson), was president of the American Institute of Mining Engineers, of which institution Mr. Hobson became a member in 1892, he urged his old friend to contribute a paper on hydraulic mining, but without success.

Mr. Hobson's membership in the present Canadian Mining Institute dated from the incorporation of the institute; his name appears in the charter of the institute, adopted by the Parliament of Canada in 1898, as one of the founders. For four years—1898-1899 and 1901-1902—he was a councillor of the institute, and for two years—1903-1904—one of its vice-presidents.

Hydraulic Mining on Large Scale.

The late Mr. Alexander Begg, who established the British Columbia Mining Record" in 1895, publishing it in Victoria, in his June, 1896, issue, printed the following: "During the summer of 1891, Mr. J. B. Hobson, a practical engineer of great experience, with two men, went over the ground on the Horsefly River, where at the present time active hydraulic operations are being carried on. In the fall of the same year practical steps were taken for the organization of a company which in 1893 was fully incorporated. Mr. Hobson then made a minute observation of the ground 10 miles wide by 20 long, drawing maps in which every stream, lakelet, prominent hill, and gulch of any consequence were shown. On this report the parties interested took up about 1,500 acres about 53 miles north of the 108 Mile House on the Cariboo road, and about six miles south of Quesnelle Lake. There are 11 mining leases in all, and the exact acreage covered by these comprises 1,475 acres of land covering the auriferous gravel deposits of an ancient river, a portion of which is similar in character to the famous ancient river deposits in California known as the Blue Lode.

(To be continued.)

SPECIAL CORRESPONDENCE

Porcupine, Swastika, and South Lorrain.

The Hollinger Extension branch of the Porcupine railroad has been completed into the Timmins Townsite, and for the present at any rate the railway construction in the gold camp is completed. The T. & N. O. took over the right of way of the Porcupine branch on December 6th of 1910, and the main line was completed in a little over six months; through various misadventures and difficulties the Hollinger Extension, between six and seven miles long, has taken as long to build. After the fire the location of the line was changed so that it would not pass over too valuable mineral ground and another cause of delay was the falling in of 400 feet of grade on Pearl Lake. The ballasting should soon be completed and trains should be running to the Timmins in February. Freight has been hauled to the Schumacher or Aura Lake siding since the first of the year. The fire at Golden City and the failure of E. D. Warren & Co. has accentuated the dullness of what was previously a very languid interest in highly speculative Porcupine stocks, and until the Dome and Hollinger are producing steadily there is not likely to be any general revival of interest. The Dome is still running four diamond drills and has now available one 12-drill compressor. Another machine of the same capacity has been ordered and a contract has been signed with the Porcupine Power Company for a thousand horse-power from Sandy Falls. Work on the Dome mill has been considerably hindered by the very severe weather that has prevailed. At the Hollinger good progress is being made with the mill. Development on the main vein at the 200-foot level continues to be quite satisfactory. Since it was picked up it averages five feet of quartz in the drift and cursory assaying shows from $30 to $40 per ton. Where the new ore shoot was first cut it was extraordinarily rich.

Development on the Vipond also continues very satisfactorily. Both of the main veins have now been cut at the 200-foot level and both show ore of very much the same values and body as at the 100-foot level. The No. 3 vein has been more recently crosscut and shows apparently the same grade of ore as at the 100-foot level where a large body ran over $11 to the ton. The mine now presents eight faces of pay ore, from which the mill can draw when it is completed, and since the new compressor is now running the underground development is now proceeding at a much more rapid pace.

At the Rea, Mr. Oscar Bergstrom has installed an assaying plant and both the 200 and 300-foot levels have been carefully sampled and the assays are now being run. In the meanwhile the main shaft is being sunk to the 400-foot level.

Core at 92 and 132 ft. at the Martin Porcupine property adjoining the big Dome on the south show very fine free gold in the quartz. From the 85-foot core to the 100-foot core there are fifteen feet of quartz and schist very highly mineralized. The core showing gold is included in this section, the other native gold core at 132 feet is in a quartz stringer. Small stringers of quartz on the surface show rich gold.

Frank C. Armstrong, of New York, and D. Lorne McGibbon, of Montreal, who are operating on a large scale in the Northern Ontario field now have recently bought control of the Swastika mine at Swastika. It is reported that the new holders bought their stock at 45 cents, and this and the favourable developments below the 200-foot level at the mine caused a considerable advance in the stock. At a distance of 50 feet from the shaft the Hughes vein has been cut and has been opened up for a distance of two feet six inches. The camp buildings have been finished and work is in full swing.

Mr. Ernest Williams, who has for the past year been manager of the Bewick Moreing holdings on the field, has left for England, and during the remainder of the winter months the staff will be reduced. In the spring there will be renewed activity in assessment work, it is expected.

The Foley-O'Brian property has closed down for the time being, and the manager, Mr. Rickard, has left the camp for Mexico. The Foley-O'Brian was one of the first to commence underground development in the Porcupine camp.

The Dome Lake Mining Company has recently purchased a small second-hand plant and will instal it on their properties on Edwards Lake in the near future. Two shafts are being put down 800 feet apart and a diamond drill is working to cut the ore body.

A diamond drill is now working on the Cartwright claims in Mountjoy Township. Previously a contract had been sunk to the 50-foot level and some crosscutting done.

The longest spell of very severe cold that the North has known since mining operations commenced caused a very considerable amount of hardship, but fortunately, as far as can be ascertained to date, no fatalities have occurred among prospectors. Very few men who went abroad in the very cold spell escaped without freezing their nose, ears or fingers, but as far as has been reported no serious injuries were inflicted. Surface work was, of course, very seriously hampered by the intense cold, but at no time was it altogether discontinued.

Cobalt, Elk Lake, Gowganda and South Lorrain.

If the smelter returns coincide with the mine assays the Temiskaming Mining Company last week shipped the richest car of ore that has ever left the camp. It weighed 31.3 tons, and was worth at the current price of silver $110,397. The ore, which was handpicked, came from the 500-foot level, where the Temiskaming is now stoping some very spectacular ore.

With the McKinley-Darragh dividend cheques for January 2nd, went a financial statement which showed on December 23:

Cash on hand	$375,441.81
Ore at smelter and transit	130,000.00
Ore at mine and ready to ship	100,000.00
	$605,441.81

At the La Rose proper sinking is continuing in the winze below the third level with a view to exploring the country below the big fault which cut off the values at the 200-foot level. Extensive exploration and crosscutting will soon commence at the 460-foot level of the mine.

The Temiskaming and Hudsons Bay Mining Company has just declared another 300 per cent. dividend, payable on January 24th. Last year this company paid 1,800 per cent., and altogether has now paid back to the limited number of shareholders interested 19,300 per cent., or $1,497,873.

Since the announcement of the building of the Elk Lake road there has been a revival of activity in the Elk Lake section. The Eddy Burland Development Company, which now has control of the Hitchcock property, has resumed operations, and an order has been placed for a seven-drill compressor and two 60 horse-power boilers. It is the intention to sink right away to the 300-foot level and endeavour to discover what is there.

The Paragon Cobalt Silver Mining Company, with headquarters at Collingwood, is pushing forward development work on its claims in Willett Township. The shaft is now down 30 feet and will be continued to 100 feet before a station is cut.

The Homestake mines, nine miles north of Gowganda, are reported to have ordered a three-drill compressor and full equipment in order to open up its properties. Three shafts have been commenced already, but have not been sunk below 50 feet.

In South Lorrain the Bison Consolidated, operating the Ross claim, is sinking a shaft to the 100-foot level preparatory to crosscutting for its vein, which at the surface, was of a very strong smaltite character. The shaft is now down 40 feet.

The Kerr Lake Mining Company has declared its usual quarterly dividend of 5 per cent., payable on March 5th. This dividend calls for $250,000. The company will in March have paid 229 per cent. or altogether $3,870,000.

The Canadian Gowganda, near Gowganda, has shipped seven and a half tons of ore to the Cobalt sampling works. The property will now be shut down till the returns from the shipment have been received and further capital has been raised.

During December the Nipissing mined ore of an estimated net value of $225,156 and shipped ore of an estimated net value of $303,600. Of the ore shipped no less than $267,600 was in the form of bullion from the high grade mill. Excellent progress is being made with the low grade mill. Development at the lower levels of the Meyer, Fourth of July and No. 100 is proceeding very satisfactorily and the drifts to the east are still in good ore.

The production of the Trethewey mine for the year just completed totalled 716,464 ounces valued at $373,486 slightly below the production of the previous year chiefly because so much development work had to be accomplished earlier in the year. The production came from 572 tons of ore including 443 tons of concentrates containing 478,205 ounces and mine ore containing 231,620 ounces bullion 6,639 ounces. To date the Trethewey has produced 5,000,000 ounces.

From the north cross cut of the Coniagas at the 75 foot level the Coniagas has just cut five veins the largest of which is from three to four inches wide of high grade silver. As they are all within fifty feet and there is a considerable amount of milling ore in the wall rock the discovery is of importance.

At the annual meeting of the Green Meehan mining company it was decided to accept the offer of the Santa Maria mining company of Buffalo for $150,000 for the property. The Santa Maria mining company is now working the property under lease and some ore has recently been shipped.

It is stated that in driving a tunnel at the Thompson Gamey property near Spawning Lake in the Gowganda district a calcite vein 18 inches wide has been cut carrying some silver.

GENERAL MINING NEWS

YUKON TERRITORY

Dawson.—The stampede to stake on the new placer strike on the South fork of Sixty Mile River is the greatest since the first Klondyke strike. Two hundred men have been racing for six days with teams, many going night and day and stopping only long enough to cook, get a little rest and then push on.

Ernest Miller, Frank Wagner and Louis Cruickshank, who happened to be at Ogilvie, 50 miles above Dawson, and were the first to arrive have just got back. They staked below John Matson, discoverer, and John Pike, who got the original claims. Clarence Skelly, a Dawson machinist, was also among the first. Two Slavonian wood choppers, and a big party of miners from Stewart City, were also in the lead.

Mr. Miller declares that it was the hottest race he ever saw; he met 75 outfits rushing from Dawson, among them many Moosehide Indians, hired with their teams by mushers. All trained dogs in the country and all real prospectors are going. Miller and others are preparing to go back at once with outfits for sinking several holes. He says he would not take $50,000 for his claim, basing his valuation on Matson's prospects.

ONTARIO.

Ottawa.—Representations have been made to the Government for the appointment of a special commission into the lead zinc industry, and to assist it by a proper tariff or bonus on both. The lead bounty expires in June, and it is desired that in place of waiting for the tariff commission, special enquiry be made meanwhile.

Cobalt.—The mill report of the Buffalo mine for December reports that the mill during the month treated 4,088 tons of ore. The average assay of the ore before being milled was 40.27 ounces of silver a ton and the amount of silver recovered was 144,440 ounces, or 87.70 per cent. of the silver disclosed by the assay. The expense of running the mill was $7,636.73, and the value of the silver recorded computed on an average price of 54⅝c an ounce was $78,900.22. The silver paid for during December which had been shipped previously amounted to 124,798 ounces.

Cobalt.—Figures just compiled show that the bullion shipped from the Cobalt camp during 1911 amounted to 3,772,920 ounces, worth $2,012,428. Of this the Nipissing contributed no less than 2,352,758 ounces, valued at $1,268,495. Last year, the first year the Cobalt camp produced bullion, only 945,702 ounces, worth $501,815, were shipped from the camp. The Nipissing and Buffalo ore is sent to New York; all the other shippers send to Mocatta & Goldsmid, and other London bullion brokers. The shippers of bullion from the Cobalt camp during the past year were:

	Ounces.	Value.
Buffalo	97,413	$52,008
Crown Reserve	375,214	192,125
Kerr Lake	14,687	7,793
Nipissing	2,352,758	1,268,495
*Nova Scotia	530,350	277,769
O'Brien	275,506	146,527
Temiskaming	84,409	46,286
Cobalt Townsite	3,537	1,919
Cobalt Lake	5,503	2,290
Colonial	3,691	1,950
Cobalt Central	800	368
Drummond	3,050	1,638
Green-Meehan	391	208
Hargraves	5,403	2,708
Hudson Bay	8,519	4,124
Nancy Helen	227	125
Silver Cliff	2,363	1,209
Silver Bar	332	176
Trethewey	6,638	3,569
*Wildman	241	120
Wyandoh	668	350
Miscellaneous	1,220	650
Totals	3,772,920	$2,012,428

*Customs ore.

Port Arthur.—The City Council and the Atikokan Iron Co. the other day reached an agreement whereby the company will locate here a $5,000,000 steel plant, to employ 2,000 men, contingent upon the Government renewing the iron bounties. It is estimated that there is already proved in the district between Sudbury and Manitoba enough iron ore to last Canada 100 years, but which it is not profitable to develop without Government assistance.

Cobalt.—During the month of December the Nipissing mined ore of an estimated net value of $225,156 and shipped ore of an estimated net value of $303,600. The ore mined is about on an average of the usual monthly production of the mine.

COMPANY NOTES

Mr. P. A. Robbins, general manager of the Hollinger Mine, Porcupine, has made public the long-expected report.

Mr. Robbins estimates that there is no less than $10,230,000 worth of ore in sight at a moderate depth. He estimates the profits for the next four or five years at $7,500,000, and that a profit of $2,500,000 will be added on every 100 feet the mine goes down.

As regards depth, he points out that similar formations to the Hollinger elsewhere have shown workings 1,000 to 2,000 feet below the surface.

The report contains results of sampling on various veins, both upon the surface and underground. The estimates of tonnages and gold contents are based upon allowances for the persistence of values beyond the present workings.

Approximately 3,000 samples were taken, involving the chipping of 8,400 feet of sample trenches. A minimum stoping width of 3 feet has been allowed, and a minimum of $4 per ton has been included as payable.

No. 1 Vein.

Surface exposure 950 ft., average width 9½ ft., average assay value $32.96 per ton in gold, 100 ft. level, 1,000 ft. of drifting in payable ore, average width 8 ft.; average gold value, $31.54 per ton; 200 ft. level, 350 ft. of drifting, average width 9⅓ ft.; average gold values, $49.30 per ton.

Vein No. 2.

Exposed upon surface 300 ft.; average width, 7 ft.; average gold value, $7 per ton.

Cross cut at three points upon 100 ft. level, proving additional length of 450 feet. Cross cut at one point upon 200 foot level; 25 feet of drifting upon 100 foot level. Cross cuts show the following values at the points cut: $7.20 over width of 13 ft.; $16 over width of 8 ft.; drift upon 100 ft. level averages approximately $20 over width of drift for the distance of 25 ft. driven.

Vein No. 3.

Exposed 350 ft., upon surface shows average gold value of $9.30 per ton over average width of 5½ feet.

35 ft. of drifting upon 100 ft. level shows $4.50 per ton over an average width of 5.2 feet.

Vein No. 4.

Exposed 375 feet upon surface, showing average gold contents of $11.60 per ton, over an average width of 8 feet.

Cross-cut at 100 ft. level shows width of 22 feet, and average gold value of $16 per ton over full width.

50 feet of drifting at 100 ft. level shows $32.40 per ton across width of drift.

Vein No. 8.

Shows an average width of 7 ft., carrying $13.92 over an exposed length of 86 feet upon surface.

Cross-cut upon 100 ft. level shows width of 25 feet, and gold value of $7 per ton.

Besides the above veins there are 31 veins upon which no development work has been done. These have been exposed at intervals upon the surface and thoroughly sampled.

Estimated Tonnage and Values.

Vein 1—Deepest workings, 200 ft.; depth of vein allowed, 300 ft.; estimated tonnage, 210,000; gross gold contents, $7,560,000. Vein 2—Deepest workings, 200 ft.; depth of vein, 200 ft.; estimated tonnage, 110,000; gross gold contents, $1,200,000. Vein 3—Deepest workings, 100 ft.; depth of vein allowed, 100; estimated tonnage, 20,000; gross gold contents $150,000. Vein 4—Deepest workings, 100 ft.; depth of vein allowed, 200 ft.; estimated tonnage, 35,000; gross gold contents, $450,000. Vein 8—Deepest workings 100 ft.; depth of vein allowed 200 ft., estimated tonnage, 10,000; gross gold contents, $140,000; miscellaneous veins, surface, 100 ft.; estimated tonnage, 77,000; gross gold contents, $730,000. Totals: Estimated tonnage, 462,000; gross gold contents, $10,230,000.

In the aggregate, the ore bodies so far discovered will yield, for each 100 feet of depth, approximately 225,000 tons, containing a gross gold value of $4,000,000, from which a net profit of $2,500,000 may be expected for each 100 feet of depth.

Estimated Profits.

Profits during the next four or five years should amount to $7,500,000, and should continue after that period. Every 100 feet of additional depth upon the No. 1 vein below 300 feet will add $2,100,000 to the profits, and the continuance of other veins below the arbitrary depths allowed will also add considerably to profits.

Comprehensive tests made upon the ore have shown that by means of the cyanide process practically a complete extraction of values may be obtained.

Experience in similar rock formation in other parts of the world has shown that veins continue to depths of 1,000 to 2,000 feet, so that there can be no doubt as to the conservatism of the estimated depths of the Hollinger veins.

A four compartment shaft is being sunk, and is expected to break through to the 200 foot level this week. Sinking will be continued to 400 feet. A winze is about to be started from the 200 foot level, which will be driven to 400 foot level on main vein at once.

Total underground work to date: Shafts 366 feet; winzes 127 feet; raises, 82 feet, drifting, 100 ft.; level 1,289 feet; 200 ft. level 370 feet; cross-cutting, 100 ft. level 1,233 feet; 200 ft. level, 50 feet. Total, 3,717 feet.

The Mill

After giving technical details of the new mill, Mr. Robbins says that it will cost $275,000, and expects to have it in operation in April.

Its crushing capacity will be about 300 tons per day, with provision in its construction for such increase as may become necessary, while the cyanide plant is being constructed for a capacity of 500 tons per day.

Financially, the company is in a sound condition. There are 50,000 shares of stock in the treasury, which have an intrinsic value far exceeding all requirements.

The Liabilities.

The only current liabilities are "accounts payable," amounting to $150,403. Most of this is due to the original syndicate, the members of which have made the necessary financial arrangements to provide the further sum of $275,000 required to carry the work in hand to completion.

Hence by the time milling operations are commenced, the company will be in possession of plant and development work costing approximately $700,000, and ore reserves amounting to approximately $10,000,000 gross ,both of which items will be clear assets over and above any indebtedness, the treasury reserves being more than ample to offset all loans or other liabilities contracted for the purpose of completing the plant and bringing the mine to a producing state.

Mr. Robbins concludes his report by stating that the future of the company is positively assured.

BELL ASBESTOS.

The annual meeting of the stockholders of the Bell Asbestos Mines was held at Ambler, Pa., U.S.A., resulting in the return of the present officials, to serve for the year 1912. Previous to the meeting the Board of Directors declared a dividend from the result of the mines for the year 1911 of 100 per cent., and also an extra dividend of 25 per cent. The asbestos bearing rock mined by the Bell Asbestos Mines has always been very rich, some reclamations in 1911 having run as high as 14 tons of asbestos fibre to each 100 tons of rock passing through the mill. Mr. George R. Smith, whose supervision as mines manager has been so successful in the past, still continues to care for the material interests of the company.

CROWN RESERVE.

The annual statement of the Crown Reserve Mining Company shows net profits of $1,279,739, for year ended December 31, 1911. This is equal to 72.30 per cent. on the capital stock. The company now has a cash surplus of $764,851 and ore on the dump of 500,000, which is not treated as an asset. We cannot do better than give a summary of Messrs. Carson and Cohen's reports which follow:

Colonel Carson's report contained the following gems of interest:

Total production to end of 1911, $6,581,847.77.
Total dividends paid, $3,714,509.40.
Production, 1911, $1,833,516.80.
Net profit, 1911, $279,739.79.
Dividends 1911, $1,061,288.40.
Surplus, December 31st, 1911, $764,851.76.
Added to surplus in 1911, $104,865.25.
Written off in 1911, $160,977.63.
Value of ore on dump, $500,000.
This is not entered as an asset.

Mr. Cohen, general manager, says in part: "We are getting richer ore at lower levels than we ever did before. Two-thirds of the property not yet touched. There is no reason why this should not be a producer.

"Development of low grade ore is very important, as results show 25 per cent. increase over last year's estimate. Milling ore alone paying all working costs, leaving high grade as profit. After producing over 3,430,000 ounces of silver for the year, the mine has more ore in sight than a year ago."

STATISTICS AND RETURNS

B. C. ORE SHIPMENTS.

The famous Whitewater properties near Kaslo, which are being operated by John L. Retallack & Co., were on the shipping list last week for the first time this year, sending 43 tons to the smelter. A new shipper was the Nickle Plate mine at Hedley, B.C., which sent a consignment of 41 tons of concentrates to the Trail smelter. The Nickle Plate is one of the most profitable mines in British Columbia, last year paying dividends of 25 per cent.

Both the big copper producers in the Boundary country are again operating at full strength, the British Columbia Copper Company and the Granby Company being responsible for 30,526 of last week's total shipments of 35,885 tons. The total shipments for the year to date from the Kootenay and Boundary districts are 106,512 tons and the ore smelted for the year is 99,408 tons, and for the week 33,552 tons. The Knob Hill at Republic, Wash., last week shipped 56 tons. The figures in detail for the week ended January 20th, and year are:

Boundary Shipments.

Granby	20,565	59,421
Mother Lode	7,150	20,395
Emma	1,130	1,822
Unnamed	242	762
Rawhide	1,120	2,772
Jack Pot	319	1,008
Other mines	....	165
Total	30,526	86,345

Rossland Shipments.

Centre Star	1,946	7,409
Le Roi No. 2	199	1,200
Le Roi No. 2, milled	300	900
Le Roi	362	1,654
Other mines	....	33
Total	2,807	11,196

Slocan-Kootenay Shipments.

Sullivan	84	696
Emerald	27	218
Arlington (Erie)	42	174
Van Roi	93	298
St. Eugene, milled	420	1,260
Queen, milled	420	1,260
Granite-Poorman, milled	250	750
Van Roi, milled	800	2,400
Standard, milled	300	900
Richmond-Eureka	32	96
Whitewater	43	43
Other mines	....	635
Total	2,511	8,730

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	20,565	59,421

B. C. Copper Co.'s Receipts.
Greenwood, B.C.

Mother Lode	7,150	20,395
Emma	1,130	1,822
Unnamed	242	762
Rawhide	1,120	2,772
Jack Pot	319	1,008
Other mines	....	165
Total	9,961	26,924

Consolidated Co.'s Receipts.
Trail, B.C.

Sullivan	84	696
Emerald	27	218
Arlington (Erie)	42	174
Le Roi	362	1,654
Richmond-Eureka	32	96
Nickle Plate	41	41

Whitewater	43	43
Centre Star	1,946	7,409
Le Roi No. 2	199	1,200
Van Roi	93	298
St. Eugene	69	201
Knob Hill	56	234
Nugget	22	22
Other mines	....	777
Total	3,026	13,063

SHARE MARKET.

(Courtesy of A. E. Bryant & Co.)

NEW YORK CURB.

	Bid.	Ask.
Braden	5⅝	5¾
B. C. Copper	4⅛	4⅜
Butte Coal	22½	22¾
Giroux	4 9/16	4⅝
Greene-Canadian	8⅞	9
Inspiration	10½	10⅝
Yukon Gold	3¾	3½
Goldfields Cons.	4⅛	4½
Nevada Cons.	1/16	⅛
Miami	24⅛	24½
Granby	.37	..
Ray Cons.	17⅞	18
Chino	20⅛	20¼
United Copper	3¾	3½

COBALT STOCKS.

	Low.	High.
Bailey	.01⅞	.02
Beaver Consolidated	.41	.42
Buffalo	1.50	..
Chambers-Ferland	.10	.10½
City of Cobalt	.07½	..
Cobalt Lake	.27¾	.28
Coniagas	6.85	6.95
Crown Reserve	3.00	3.06
Great Northern	.10½ Bid	..
Gould	..	.03
Gifford	.01	.01½
Green-Meehan	.01⅛	.01¼
Hargraves	.04	.04⅞
Kerr Lake	2.80	..
La Rose	3.70	3.75
McKinley-Darragh	1.65	1.66
Nipissing	6.85	6.95
Nova Scotia	.05 Bid	..
Ophir	.05½	.06
Otisse	.01	..
Peterson Lake	.06½	.06¾
Rochester	.02 Bid	..
Right of Way	.06	.06¼
Silver Leaf	.03	.03¼
Silver Queen	.. Asked	.03
Temiskaming	.33	.35
Trethewey	.75	.75
Wettlaufer	.80 Bid	....

PORCUPINE STOCKS.

	Low.	High.
Apex	.07	.08½
Dobie	.. Asked	.75
Crown Charter	.10	.14
Dome Extension	.30½	.34
Eldorado	.09	.09½
Foley O'Brien	.24	.25
Hollinger	13.25	13.85
Jupiter	.49½	.50
Moneta	.15	.19
N. Ont. Exp.	2.95 Bid	..
Pearl Lake	.19	.20
Porcupine Central	3.50	3.62½
Porcupine Imperial	.06	.06½
Porcupine Northern	.94	.95
Porcupine Tisdale	.03½	.04
Porcupine Southern	.93	.94
Preston East Dome	.06¼	.06½
Rea	1.36	1.40
Standard	.18	.18½
Swastika	.24	.24½
Vipond	.45	.46
United	.02½	.03
West Dome	..	.45
American Gold Fields	1.00	1.01

Sundry.

Island Smelters	..	.05
Canadian Marconi	4.00 Bid	..

SILVER PRICES.

	New York. Cents.	London. Pence.
January 6	55	25⅜
" 8	55	25⅜
" 9	55	25⅜
" 10	54⅞	25 5/16
" 11	54¼	25 7/16
" 12	55⅜	25½
" 13	55⅜	25½
" 15	55½	25 9/16
" 16	56	25 3/16
" 17	55¾	25 11/16
" 18	56⅜	26
" 19	56⅞	26 3/16
" 20	57¼	26⅜
" 22	57⅜	26⅜
" 23	57¼	26 5/16
" 24	57⅜	26⅜

TORONTO MARKETS.

Jan. 26—(Quotations from Canada Metal Co., Toronto):—
Spelter, 6.50 cents per lb.
Lead, 4.25 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.50 cents per lb.
Electrolytic, 14.50 cents per lb.
Ingot brass, 7 to 12 cents per lb.

Jan. 26—Pig Iron (Quotations from Drummond, McCall & Co., Toronto):—
Summerlee No. 1, $23.00, f.o.b. Toronto.
Summerlee No. 2, $22.50, f.o.b. Toronto.
Midland No. 1, $19.00, f.o.b. Toronto.
Midland, No. 2, $18.50, f.o.b. Toronto.

GENERAL MARKETS.

Jan. 24—Tin, straits, 43.00 cents.
Copper, Prime Lake, 14.40 cents.
Electrolytic copper, 14.30 cents.
Copper wire, 15.25 cents.
Lead, 4.45 to 4.50 cents.
Spelter, 6.55 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 7.37½ cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $43.00 per 75-lb. flask.

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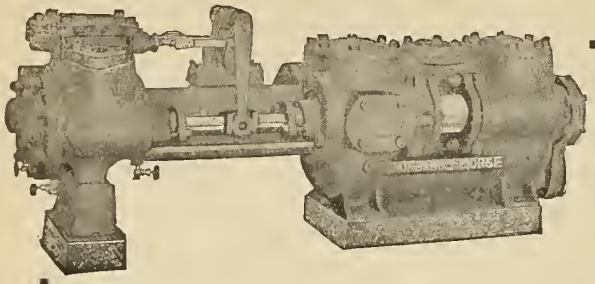

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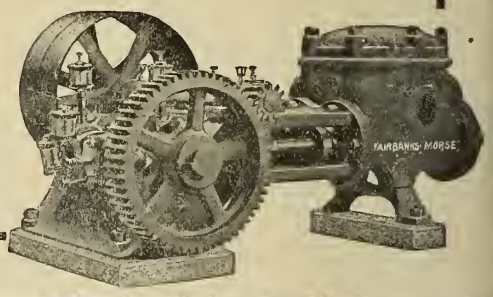

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

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1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

1064. Geology of an area adjoining the east side of Lake Timiskaming, by Morley E. Wilson.

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1137. Memoir No. 10. An instrumental survey of the shore-lines of the extinct lakes Algonquin and Nipissing in South-western Ontario, by J. W. Goldthwaite.

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1115. Memoir No. 8. The Edmonton Coal Field, Alberta, with maps, by D. B. Dowling.

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1139. Memoir 11-T. Triangulation and Spirit Levelling of Vancouver Island, 1909, by R. H. Chapman.

YUKON and NORTH WEST TERRITORIES

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

1130. Memoir No. 9. Bighorn Coal Basin, Alberta, by G. S. Malloch, accompanied by a map.

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CANADA

1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

1084. Geological Map of Canada. Scale 100 miles to 1 inch.

NOVA SCOTIA.

1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1155. Map 24A. Millstream Iron Deposit, Gloucester County, N.B., geological and topographical. Scale 400 ft. to 1 inch.

1156. Map 25A. Nipissiguit Iron Deposit, Gloucester County, N.B., geology and topography, scale 400 feet to 1 inch.

QUEBEC

1066. Map 18A. Lake Timiskaming Mining Region. Scale 1 mile to 1 inch.

1112. Map 12A. Vicinity of the Transcontinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.

1180. Map 34A. Vicinity of the National Transcontinental Railway between the counties of Levis and Temiscouata, Quebec. Scale 8 miles to 1 inch.

ONTARIO

1091. Map 8A. Lake Nipigon, Thunder Bay District, Ontario. Scale 4 miles to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

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791. West Kootenay sheet, B.C. Economic Minerals and Glacial Striae. Scale 4 miles to 1 inch.

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.

1198. Map 48A. Tulameen Coal Area, Yale District, B.C. Scale ½-mile to 1 inch.

1135. Map 15A. Phoenix, British Columbia, topographical. Scale 400 ft. to 1 inch.

1148. Map 20A. Victoria sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

1149. Map 21A. Saanich sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.

BRITISH COLUMBIA

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Has produced Minerals valued as follows: Placer Gold, $71,213,103; Lode Gold, $60,811,067; Silver, $31,095,602; Lead, $24,645,605; Copper, $60,743,405; Other Metals (Iron, Zinc, etc.), $1,083,172; Coal and Coke, $114,012,596; Building Stone, Brick, etc., $10,593,100; making its Mineral Production at the end of 1910 show an

Aggregate Value of $374,197,650

In 1910 the quantity of Ore mined was 2,216,428 tons, and of coal 3,139,235 long tons. The value of Minerals produced that year was: Placer Gold, $540,000; Lode Gold, $5,533,386; Silver, $1,245,016; Lead, $1,386,350; Copper, $4,871,512; Coal and Coke, $11,108,335; Other Minerals, $1,692,473, making the

Total Value for 1910, $26,377,066

Lode-mining has only been in progress for about eighteen years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

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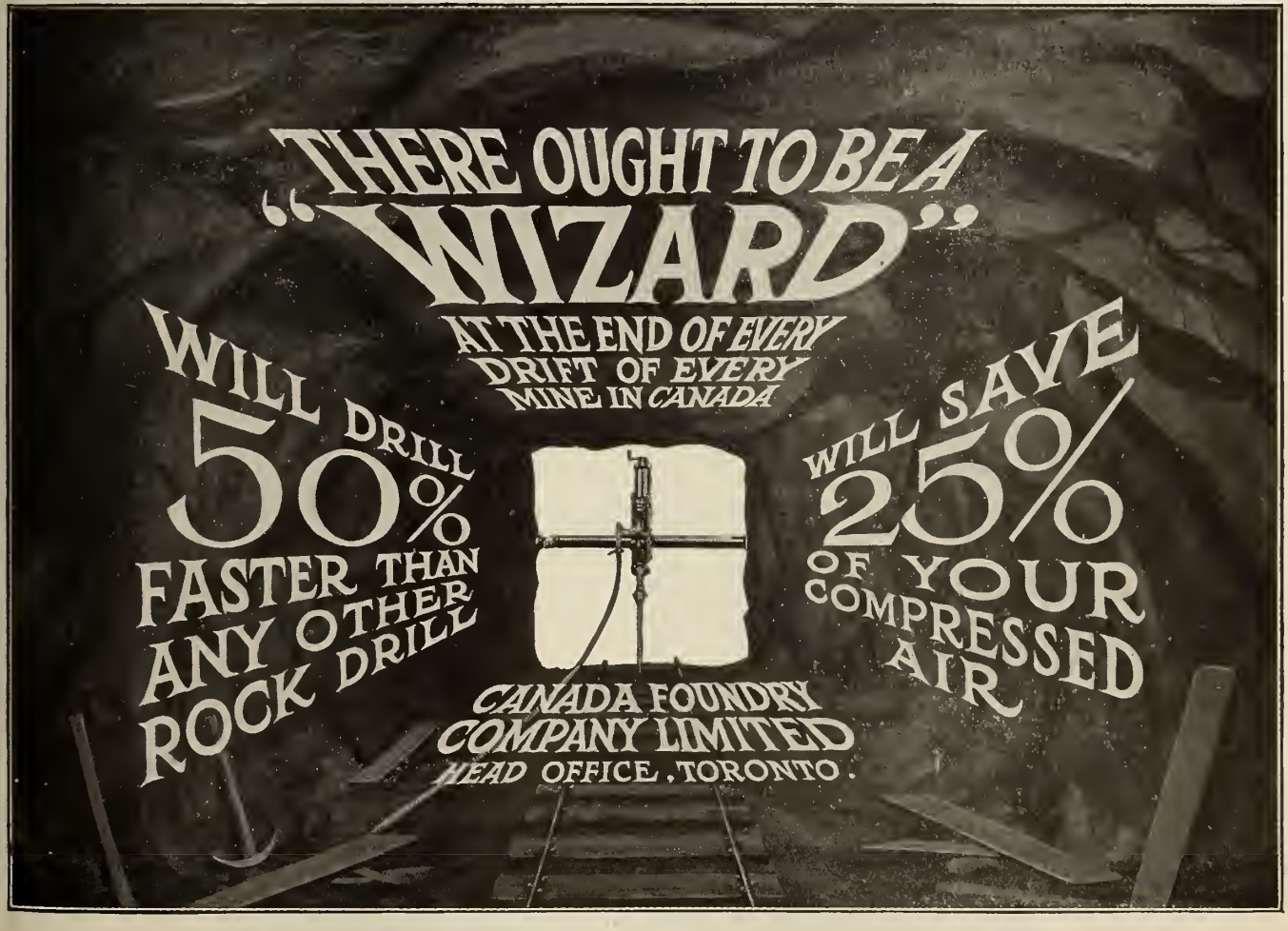
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Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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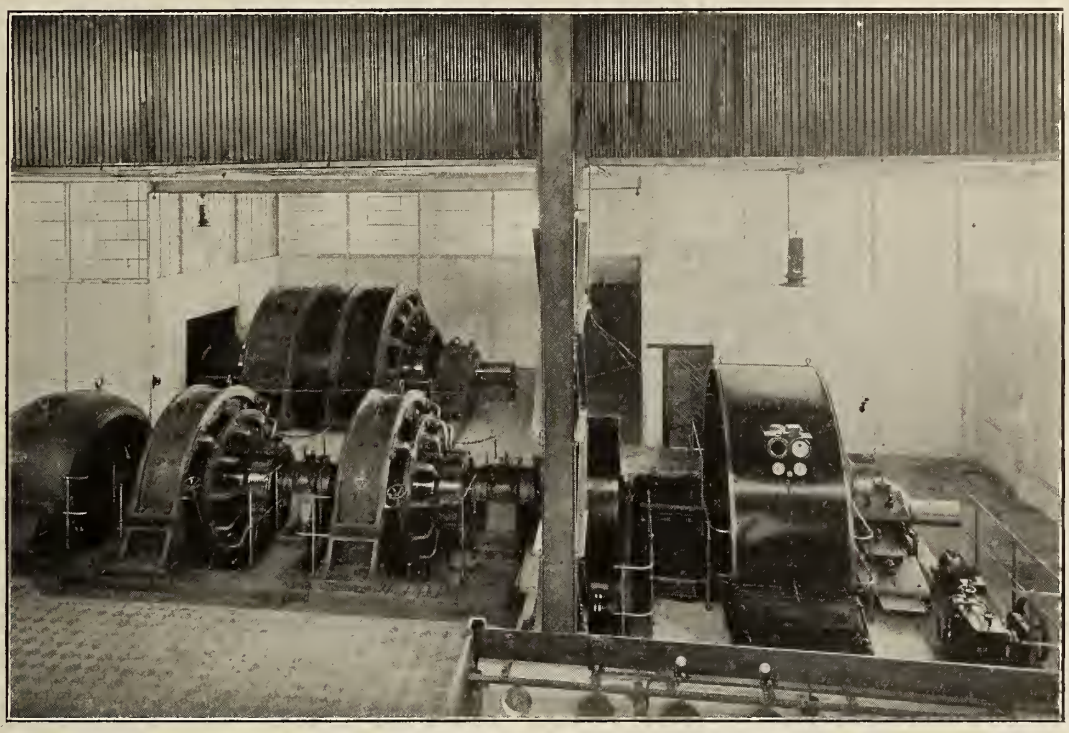

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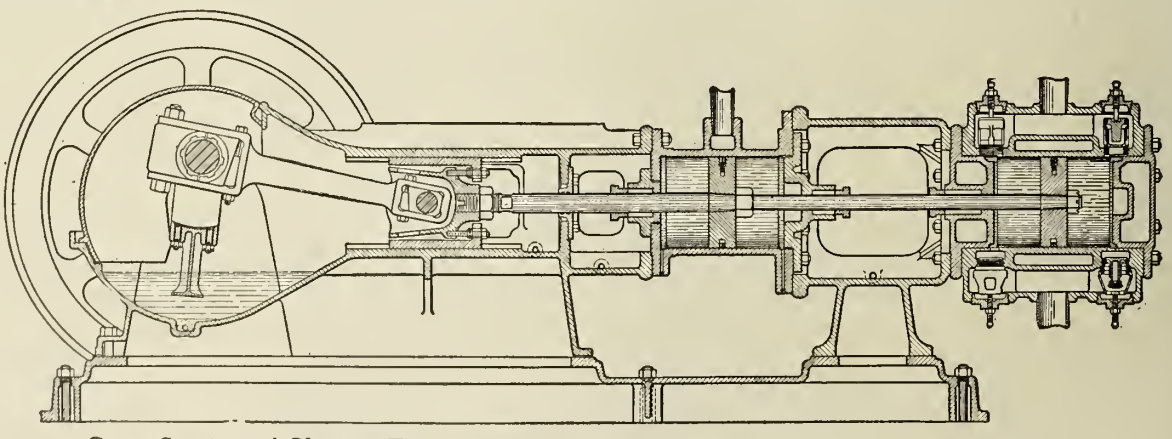

Cross Section of Clayton Enclosed Frame, Straight Line Steam Driven Compressor.

Note the tie piece construction between steam and air cylinders, as shown in cut, which allows the back steam cylinder head to be unbolted so that the steam piston may be removed at that point.

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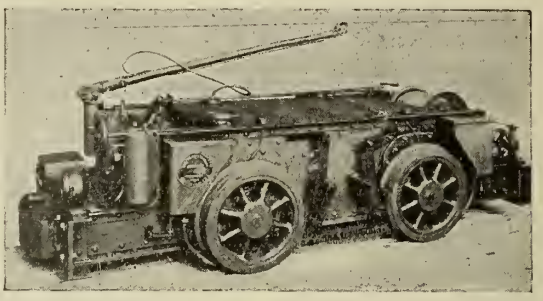

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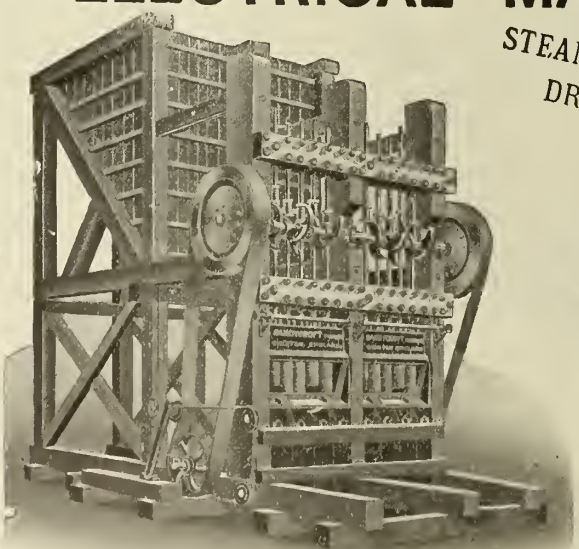

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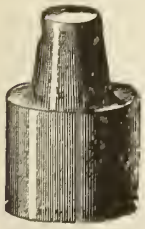

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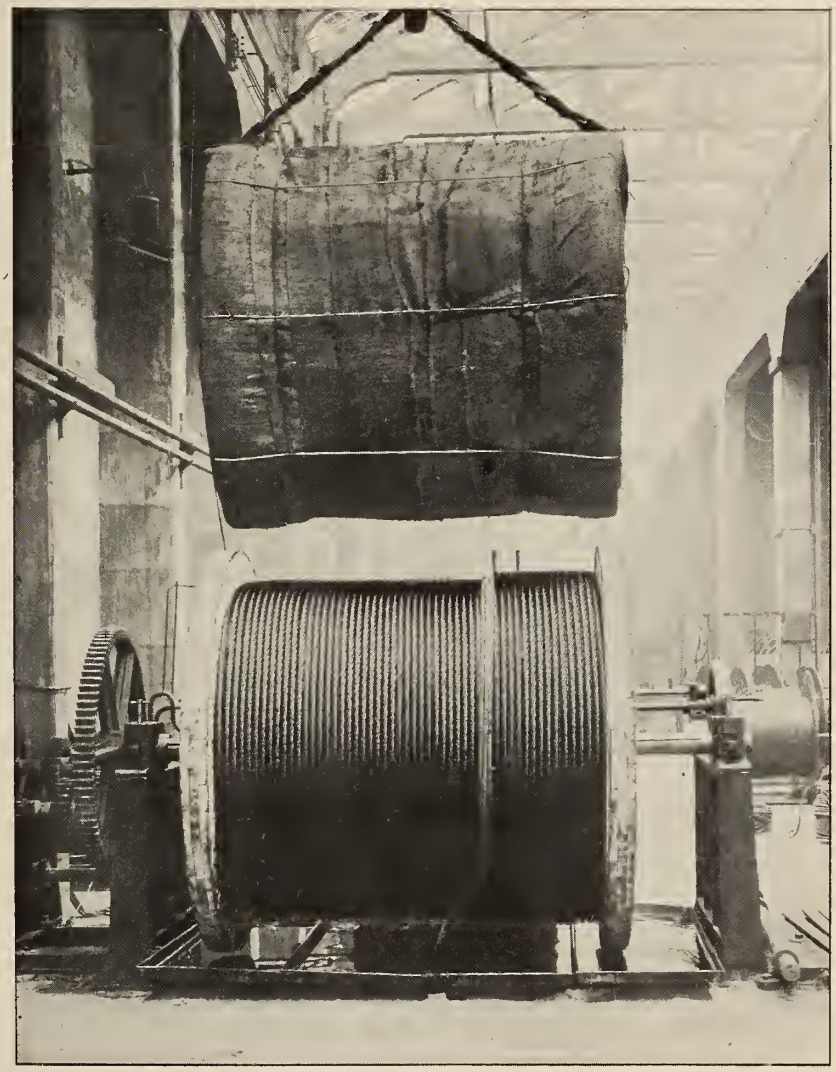

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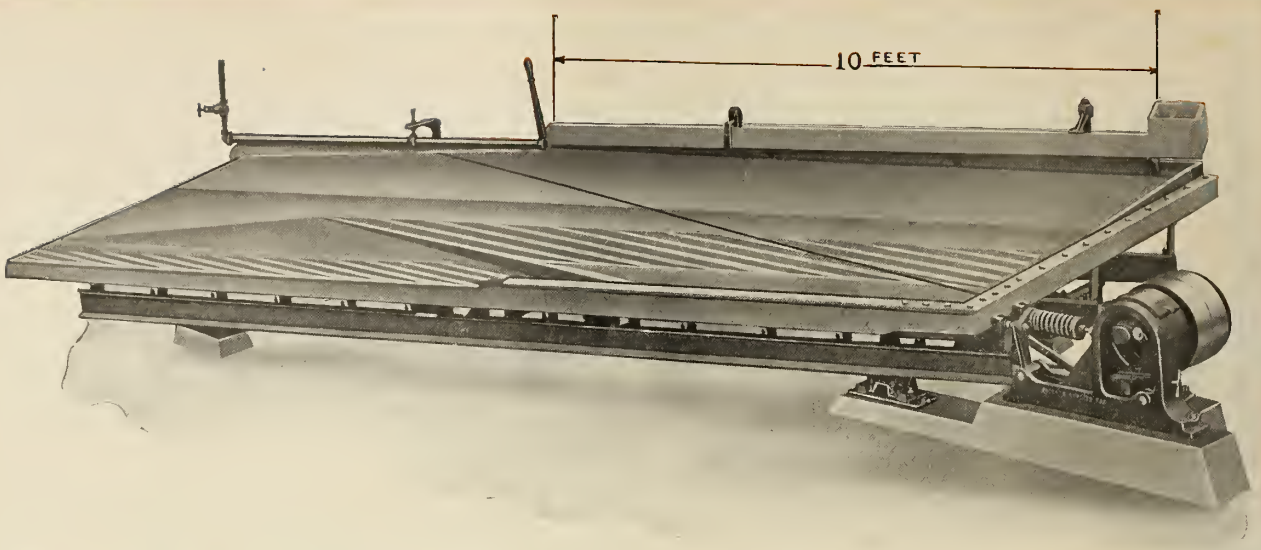

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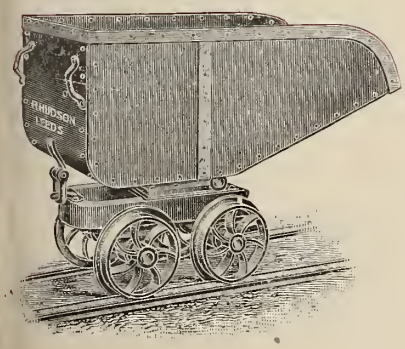

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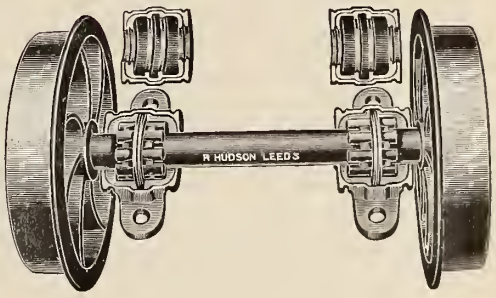

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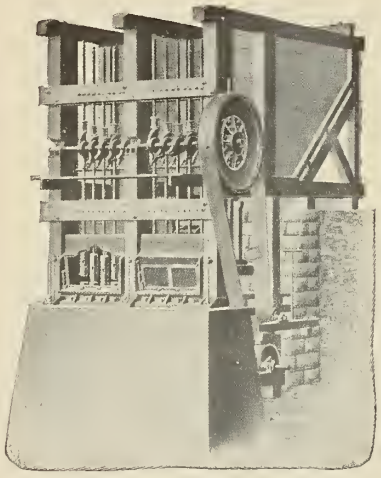

Stamp Mills
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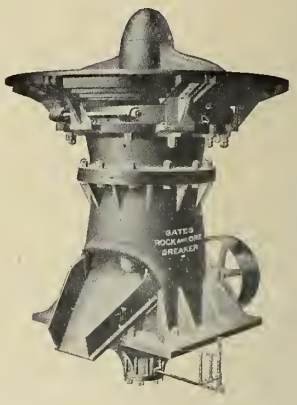
Gates Elevators
See Bulletin 1411



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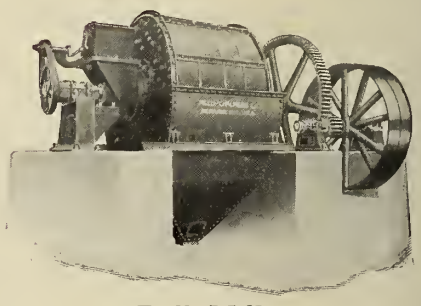

Ball Mills
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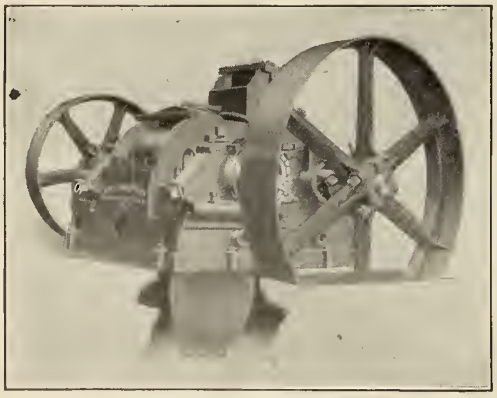
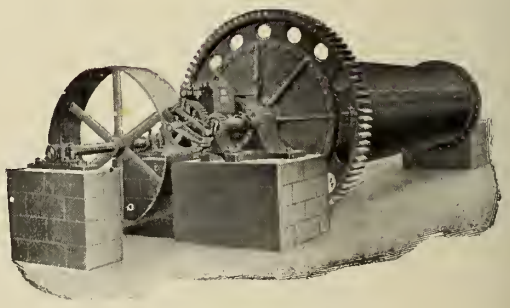


Crushing Rolls
See Bulletin 1412



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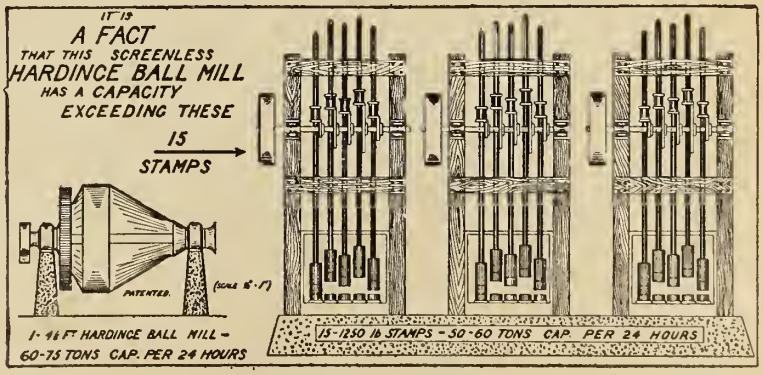
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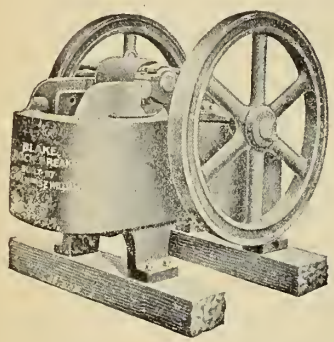

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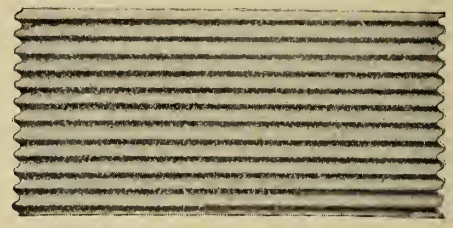

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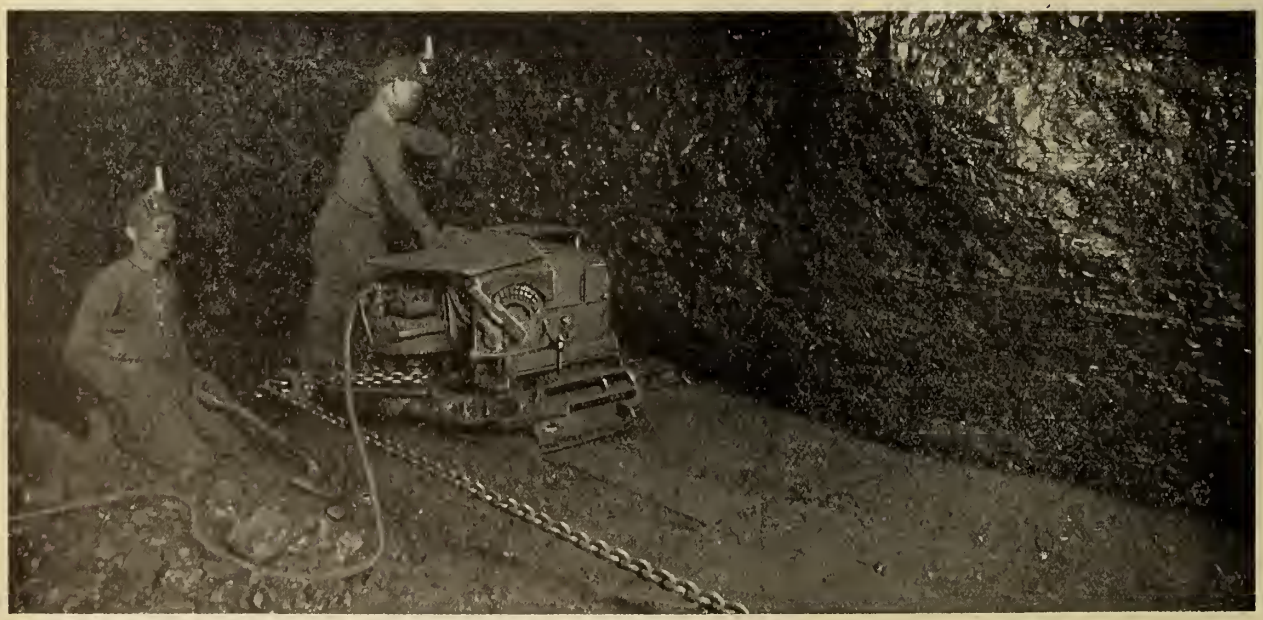

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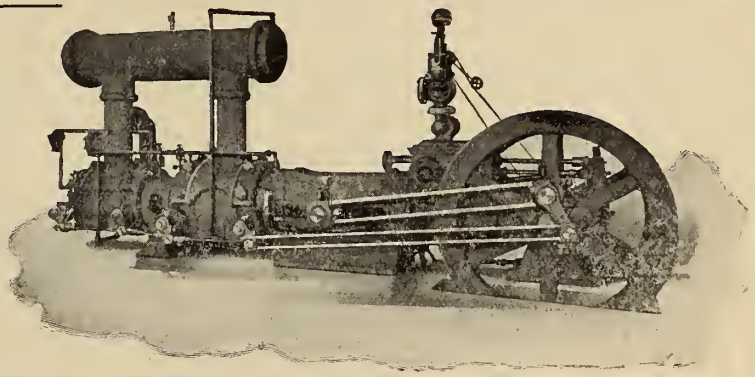

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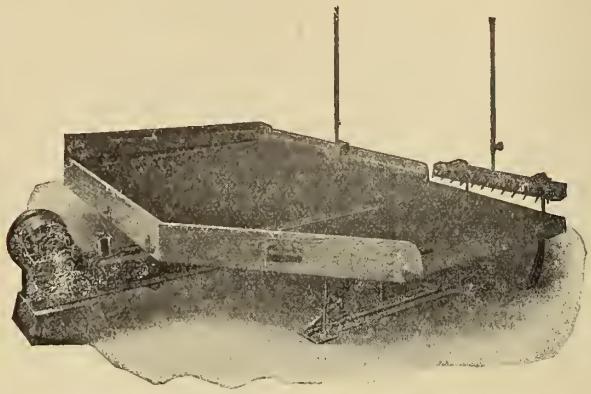

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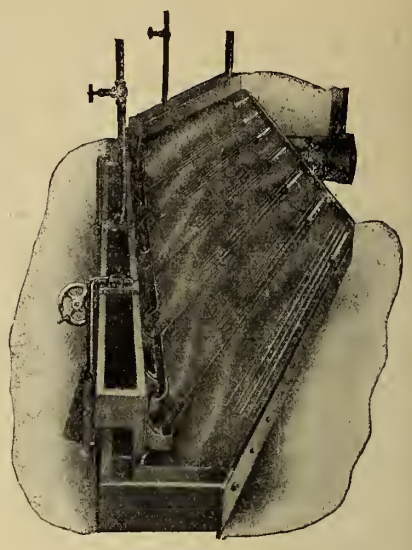

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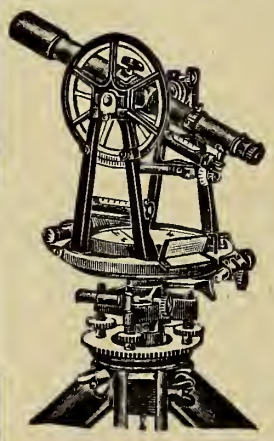

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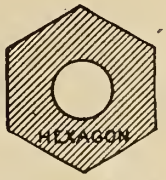

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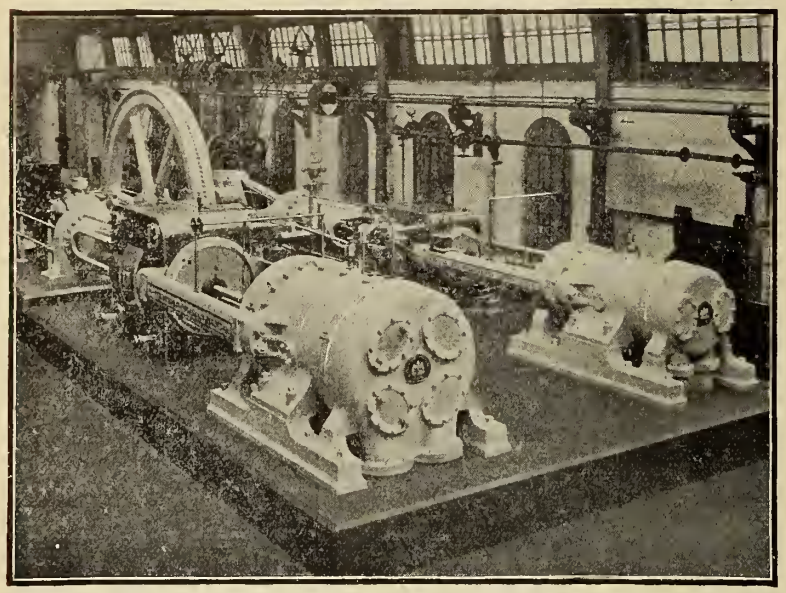

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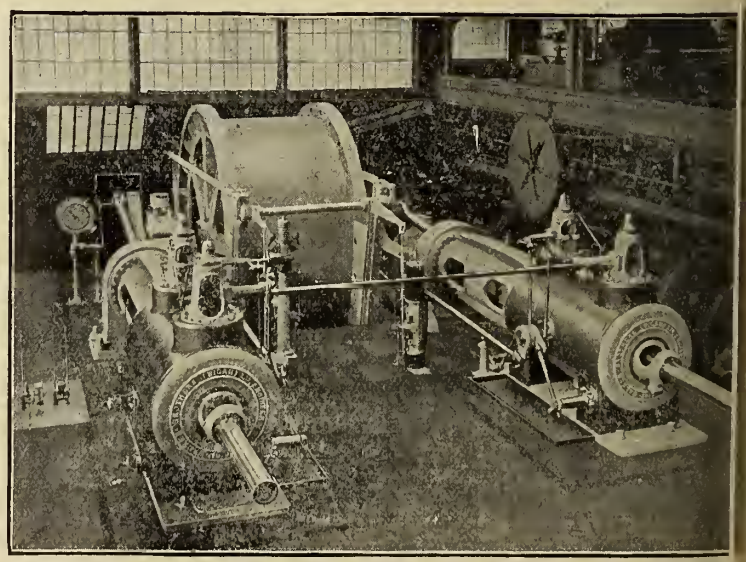

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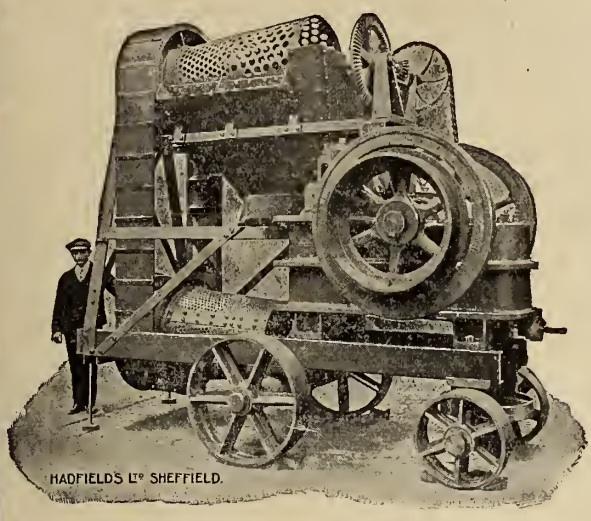

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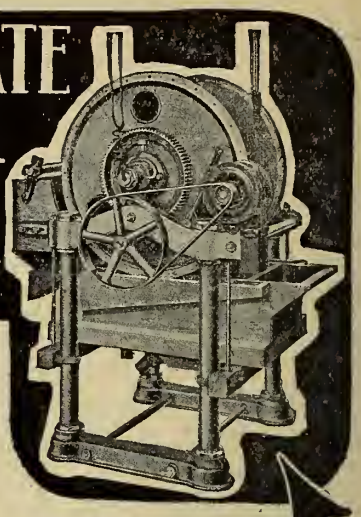

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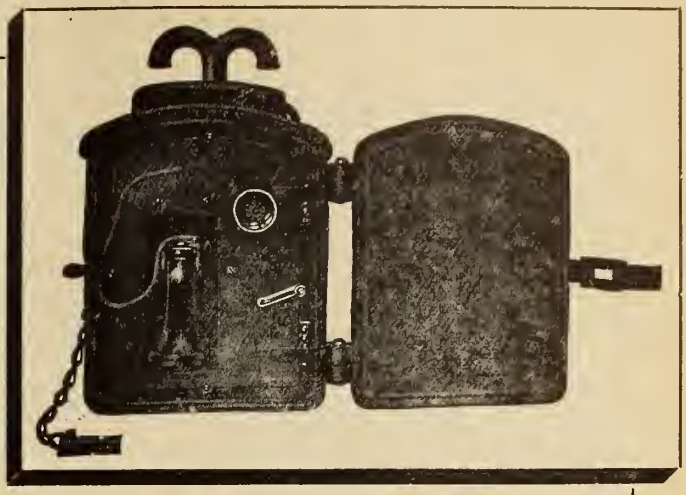

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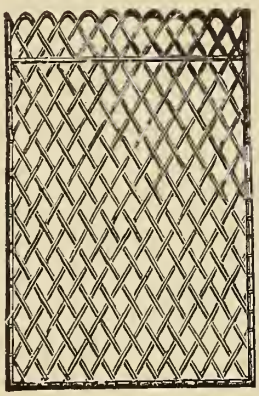

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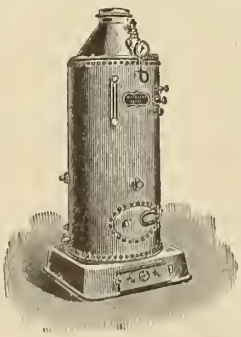

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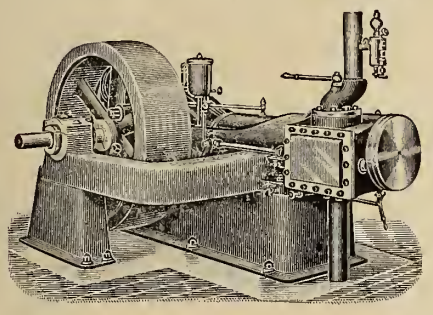

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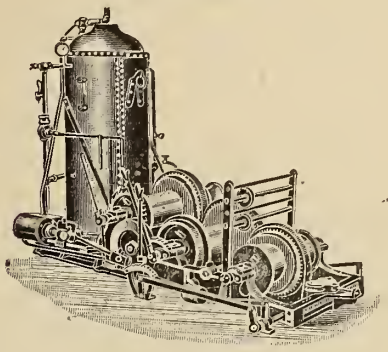

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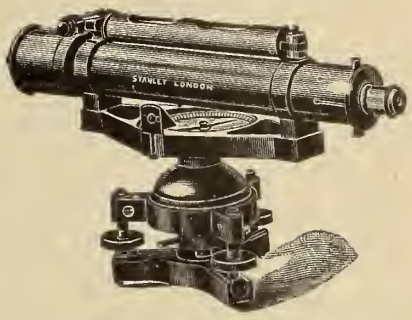

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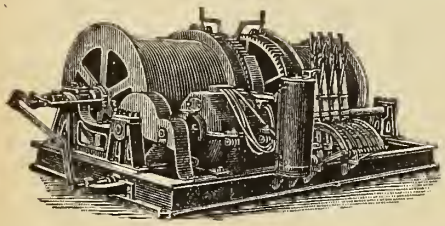

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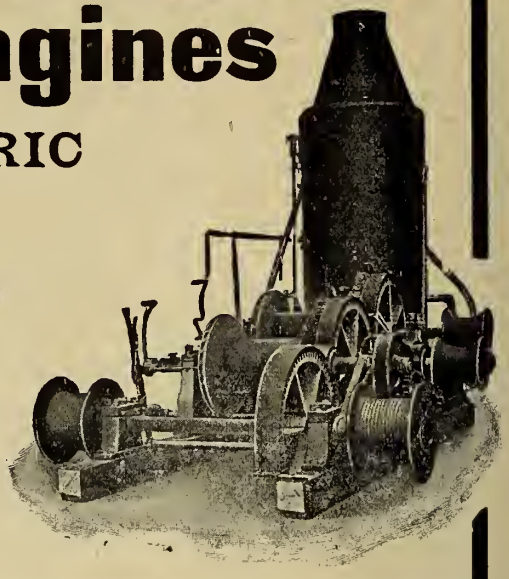

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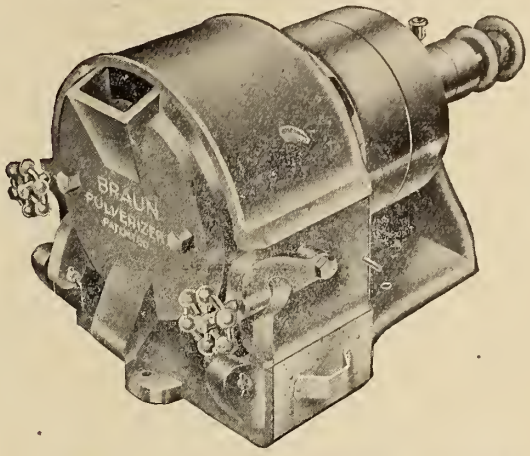

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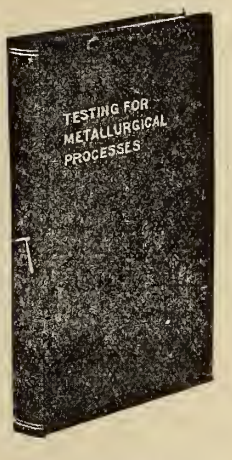

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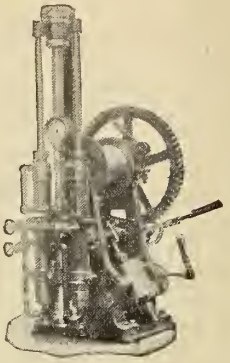

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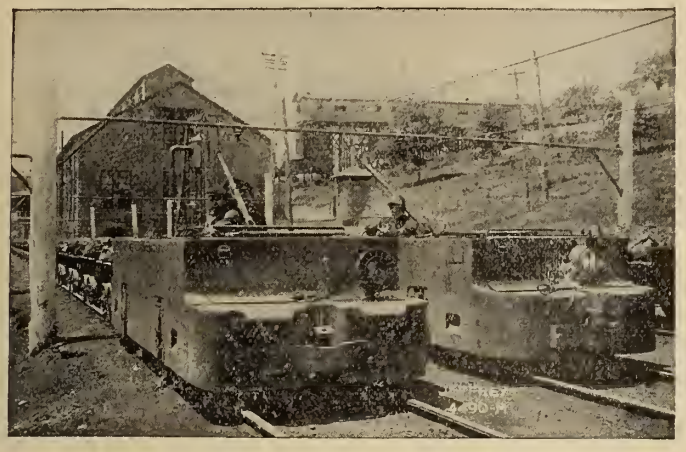

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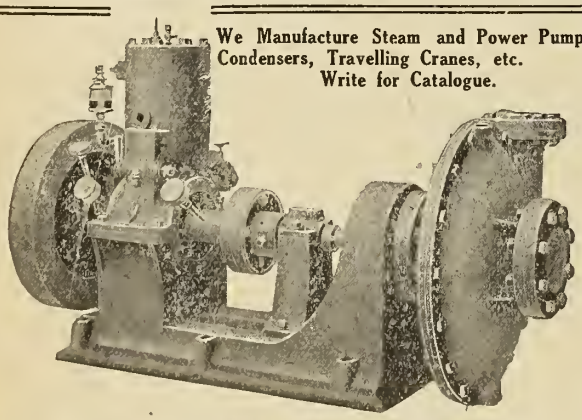

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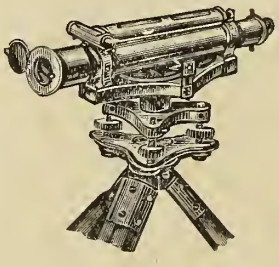

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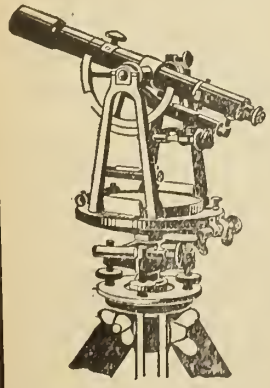

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ANNOUNCEMENT.

The publishers of the CANADIAN MINING JOURNAL wish to announce that they are prepared to handle the printing of all varieties of annual reports, financial statements, prospectuses, pamphlets, etc., etc. A particularly well equipped plant has been acquired, and it is the intention of the publishers to specialize in the printing of reports and general material pertaining to mining. It is requested, therefore, that our subscribers bear this in mind.

Another matter calls for notice. Heretofore the CANADIAN MINING JOURNAL has refrained from publishing in its advertising columns the annual statements and reports of any mining companies. Many such reports have been published gratuitously in the reading pages. In no instance has any consideration whatsoever been accepted for this kind of publicity.

It is believed now that the JOURNAL is justified in soliciting from reputable Canadian mining companies their patronage of its advertising columns. The JOURNAL will be glad to accept as advertisements, and publish as such, the annual reports, special reports, dividend notices, or other notices of all *bona fide* Canadian mining companies.

Quite apart from commercial considerations, the regular publication of these reports and notices will help to make the CANADIAN MINING JOURNAL a much more complete record of current mining history.

THE HOLLINGER REPORT.

The annual report of no Canadian mining company has been waited for with more interest than that of the Hollinger Gold Mines, Limited. For more than one reason the mining fraternity and the public generally have looked upon the issuance of this report as a critical event in the history of Porcupine.

The Hollinger has bulked large in the public eye. Shares in Hollinger have been much traded in and the mine itself has been the show place of the camp. In many ways, Hollinger is the barometer of the Porcupine mining market.

From the first, the Hollinger directors have been much criticized. To a large extent, however, they have held their peace and have been content to let the future justify their policy. They have been wise enough, also, to throw the mine open for the inspection of all

responsible visitors—a policy that does not obtain at the Dome.

When, last year, it became known that Mr. P. A. Robbins had accepted the position of general manager, confidence was felt that the mine would be developed fairly and in accordance both with the exigencies of mining in the north country and the ethics of engineering. Mr. Robbins, in short, was expected to work the property on its own merits, and to avoid the pitfall of undue optimism on the one hand and the equally dangerous slough of despond on the other. Mr. Robbins was the deliberate choice of the directors.

The peculiar surroundings of the Porcupine gold mining camp must here be brought to mind. Ontario has had several gold mining booms, all of which have left a bitter taste in the mouth of the investor. Porcupine's early days were marked by the fact that the generality of mining men were either incredulous or hostile. Months elapsed ere any degree of enthusiasm was aroused. Even yet, despite remarkably encouraging results and very large bona-fide expenditure, the camp is more or less on trial, and much has yet to be learned concerning the economic geology of the district. The fact is that Porcupine would not have been opened up for years to come had it not been for the energy and money of successful Cobalt investors. In other words, Porcupine until now has been in need of just such a report as circumstances have enabled Mr. Robbins to give us.

Having hurried over these preliminary considerations, let us glance for a moment at the substance of the first annual report of the Hollinger Gold Mines, Limited. Despite the wisdom of the quidnuncs, no positive estimate of ore reserves is made. The estimates published, are based upon very slight extensions of workings already completed and surface work done, and appear to be most cautiously made.

The company owns four claims. Two of these are partly developed, one has had some of its surface prospected, and the fourth has been almost entirely neglected. What is called the mineralized area extends across, and includes almost entirely, the first three claims. No. 1, or the main vein, striking in a diagonal direction across two contiguous claims, is a remarkable body of ore. On the surface the vein is exposed for about 900 feet, the average width being more than nine feet, and the average gold content about $33. At the 100-foot level the ore-shoot is eight feet wide, the average gold content being $31.54 per ton, and the length of drifting 1,000 feet. On the 200-foot level 350 feet of drifting showed a shoot more than nine feet in width and assaying as an average almost $50 to the ton. In making his estimate Mr. Robbins computes upon the basis of a depth of 300 feet. This is by no means excessive. It is a venture that most of us would be glad enough to take. Mr. Robbins both in his ground work and in his assumptions has been guarded, reasonable, and logical. The expectation of a working depth of a thousand or fifteen hundred feet is commented upon by Mr. Robbins thus: "Academically this is a reasonable hypothesis, commercially it is speculation and remains to be proven."

Thorough sampling and measurement showed about 70,000 tons of ore for each 100 vertical feet of No. 1 vein, the average gold content being $36. Working this out for three levels, we get 210,000 tons of ore containing $7,560,000.

On three other veins underground work has been done at the 100-foot level and estimates include an additional 100 feet vertically; and on 11 veins, where surface work only has been performed, the estimates embrace only the first 100 feet in depth. The totals thus obtained are 462,000 tons of ore containing $10,230,000, or about $22 per ton.

It is explained in the report that whilst the allowances for extensions are arbitrary, they will probably be exceeded. The main vein alone, if consistent in gold tenor, will yield $2,100,000 in net profits for each additional 100 feet in depth. Similarly, the aggregate net profit from the present known ore bodies will amount to $2,750,000 for each 100 feet in depth. This latter figure includes the former of course; but it is interesting to speculate as to how greatly this amount will be enlarged if several of the undeveloped veins turn out to be bonanzas. However, the main vein is distinctly the predominating factor at present.

The work of exploitation and the scheme of ore treatment are being planned on a scale commensurate with the magnitude of the ore bodies. These can be safely left in Mr. Robbins' hands.

The financial position of the company, we are assured by Mr. Robbins, is sound. The authorized capital is $3,000,000, divided into 600,000 shares of $5 each. There are 50,000 shares in the treasury. The current market price is about $12. Only a nominal amount of cash is on hand, but satisfactory financial arrangements have been made whereby, when milling operations are commenced in the spring of this year, the company will be in possession of a plant and mine costing about $700,000, and ore reserves containing $10,000,000 gross. These Mr Robbins refers to as clear assets, the treasury shares being more than sufficient to cover all outstanding construction and development liabilities.

In other words, the property seems amply capable of yielding at least $1,500,000 net per annum for some years to come. Mr. Robbins has estimated on only a fraction of the "probable" ore reserves. The "possible" reserves are on the knees of the gods.

* * * * * * *

In summing up our impressions of the Hollinger report we can state, without equivocation that it is more than satisfactory,—it is extremely gratifying. Evidence of care and thoroughness is visible on every page

It is true that certain minutiae are lacking, but, for our own part, we are quite willing to accept the report as it stands.

The first annual report of the Hollinger Gold Mines, Limited, is a milestone in Porcupine's history. More than that, it marks the turning point in the chequered story of gold mining in Ontario. Our felicitations are proferred to Mr. Robbins and to his directors.

SIR JAMES DECIDES.

On Monday, February 12th, history was made. On that day Sir James Whitney electrified the Legislative Assembly of Ontario, gladdened the hearts of all those who live in the new north, and administered a terrific solar plexus to the vaulting ambition of the Leader of the Opposition, by delivering himself of the news that his Government was prepared to spend the vast sum of $5,000,000 in colonizing Northern Ontario.

For the purpose of controlling expenditure a special commissioner is to be appointed. His task will be sufficiently onerous, for the territory is enormous, the needs of each section are apparent and pressing, and no amount of money could conceivably satisfy everybody. Yet the judicious distribution of $5,000,000 will go far towards ameliorating conditions that are now intolerable.

Roads, of course, are the first need. Then, gradually, all the other prime essentials of transportation and commerce must come. Already the Government has had several lessons in the art of making roads—at least it should have learned by this time how not to make them. So the North may reasonably hope for practical sympathy and help.

* * * * * * * * *

The Government of Ontario has taken a serious view of its duties. It has risen splendidly to the occasion that now offers. In all its future efforts to open and colonize the north it must not, however, lose sight of the fact that the country was opened first by the prospector and the miner, that the mining investor has spent millions in roads and general culture, and that without the mines of to-day and of to-morrow the Province would be poorer by many millions of dollars. It is the bounden duty of the Government not to overlook in any respect the welfare of the mining communities. For a long time to come agriculture will be entirely tributary to mining.

Many good men and true will hanker for the job of distributing and allocating that $5,000,000. It is our belief that no one man should be clothed with too much authority. An advisory committee composed of prominent citizens of northern towns should be called upon to aid and direct. Most certainly the mining towns should be given a very large voice in the whole matter.

No doubt Sir James and his Cabinet will have considered every aspect of the question. We make bold to throw out these suggestions on the chance of correcting a possible sin of omission.

BENJAMIN FRANKLIN PEARSON.

Few men have left a deeper impress upon the industrial development of Canada than the late B. F. Pearson, whose untimely death, as noted in another column, occurred recently in Halifax, Nova Scotia.

Mr. Pearson's was the unique distinction of having promoted the organization of the two largest coal mining and iron making concerns in Canada. In a large sense the Dominion Coal Company and the Dominion Iron and Steel Company were children of his singularly fertile brain. Other important enterprises too numerous to mention owed their birth to the same active intellect.

In addition to his wonderful range of commercial activities, Mr. Pearson was a successful politician, a lawyer, a journalist, and a notably public-spirited citizen.

It will be long ere Nova Scotia produces another B. F. Pearson. His name stands highest in the list of Canadian promoters, far outshining the rapacious product of later days.

THE BRITISH COAL SITUATION.

The prospect of a peaceful settlement of the dispute between the coal miners and the mine owners of Great Britain seems dim. The latest cables, received just as we go to press, indicate that a deadlock still exists. The last conference of the representatives of nearly one million miners brought out the fact that the majority strongly favoured a general stoppage of work on the last day of this month, unless the principle of a minimum wage for all underground employees be accepted and applied.

Already some 30,000 Derbyshire miners have notified their employers of their intention to quit work. It is expected that within a few days every union coal miner will have followed suit.

The situation is grave. The operators, still sore over the Eight Hour Act, feel strongly their humiliating position. Concession after concession has been wrung from them. Seemingly no reasonable measure of compromise will satisfy the miners.

What the outcome will be, no one can guess. Certainly a strong statesman is needed to bring the conflicting parties to a settlement.

LE ROI NO. 2.

One of the instances where even the English investor cannot complain that he is not getting a fair return for his money is Le Roi No. 2 mine at Rossland, B.C. On its capital, the company has paid eleven annual dividends ranging from 5 per cent. to 30 per cent., but nearly always more closely approaching the latter. It was recently decided at the eleventh annual meeting of the company's shareholders in London, that in future the dividend rate would be fixed at 10 per cent. per annum.

In normally prosperous years additional bonus payments will be made, but provision will always be made for adding £10,000 every year to the cash reserve, which reserve now amounts to £20,000. The reserve will be built up until it equals at least one-half of the nominal capital.

Good luck and sane management appear to go hand in hand.

EDITORIAL NOTES.

The gold mining industry of the Witwatersrand pays three-fourths of the total taxation of the country.

Regular reports as to progress at the Hollinger are to be made at stated intervals. This is right and proper.

Some exception has been taken to our editorial on the Report of the Chibougamau Mining Commission. In justice to the members of the Commission we wish to reiterate the fact that we praise warmly the Report as a whole. The only mild suggestion we made related to the form in which it was cast.

The output of Calumet and Hecla during the current calendar year will, it is estimated, reach 130,000,000 pounds. The net earnings per share, with copper at 13 cents, will be $52; at 17 cents, $104. The capitalization is $2,500,000, divided into shares of $25 each. The estimated cost of production is nine cents.

The United States Bureau of Mines superintends and controls the purchase of $8,000,000 worth of coal for the Government annually. The establishment of efficient storage facilities is one of the Bureau's important functions.

The revival of the British Columbia Mining Association promises well. The first meeting will have been held at Nelson ere this number reaches our readers. The object of the Association is to represent adequately the mining industry in all matters political. Mr. S. S. Fowler is president.

Quite unintentionally we deprived the Crown Reserve Company of $1,000,000 in our February 1st issue. Net profits for the last year were $1,279,739.79, not $279,-739.79. The former sum was given correctly in one line, but incorrectly in another. We willingly return the trifle.

PERSONAL AND GENERAL

Mr. James McEvoy, mining engineer, the Stair Building, Toronto, is delivering a series of lectures on coal mining before the mining students of Toronto University. This is a very valuable addition to the course.

Mr. W. N. Bissett, for years mine foreman at the big placer mine in Quesnel division of Cariboo district, British Columbia, operated for years by the Consolidated Cariboo Hydraulic Gold Mining Company, with Mr. John B. Hobson as manager, is in Victoria, B.C., where, in the capacity of one of the executors under the will of the late Mr. Hobson, he is attending to matters connected with the estate of the deceased mine manager.

Mr. Robert R. Hedley, chairman of the Western Branch of the Canadian Mining Institute, and Mr. E. Jacobs, branch secretary, are expected to come from British Columbia to Toronto to attend the annual meeting of the Institute, to be held here early in March. It is probable Mr. S. S. Fowler, general manager of the New Canadian Metal Company, of Nelson, B.C., who is a past president of the Institute, will also be at that meeting.

Mr. Thomas Kiddie has completed his investigations into the French process for the reduction of zinc-lead ores, and has made his report to his principals, who have not yet made public Mr. Kiddie's findings in this connection.

Mr. T. A. Pickard has returned to Vancouver, B.C., after having been for some time superintending development work being carried on at the Apex group in Hedley camp, Similkameen.

Mr. D. C. Stephens is manager of the Tacoma Steel Company's Marble Bay mine, at Van Anda, Texada Island, B.C., formerly owned by Messrs. Palmer and Christie, of Toronto, and long managed by Mr. Alexander Grant, who retired last year on account of ill-health.

Mr. Thomas Graham, chief inspector of mines for British Columbia, has been to Fernie, Crow's Nest Pass district, in connection with the establishment there of a mine-rescue station, with facilities for training miners in the use of the Draeger helmet and auxiliary apparatus.

Mr. A. E. Hepburn, of Vancouver, B.C., has been in San Francisco, California, endeavouring to promote the sale of coal mining property in British Columbia.

Mr. Richard Kirkby, who resigned the position of mining engineer with the Dominion Coal Company recently, has been appointed the general mining manager of the Earl of Weymss's Collieries in Scotland. Mr. Kirkby will have under his charge some eight or nine modern collieries.

Mr. D. H. MacDougall, the assistant general manager of the Dominion Coal Company, left for England on the "Olympic" on the 24th of January. He will return about the 1st of March. Mr. J. H. Plummer, the president of the Dominion Coal Co., will also visit England early in February in connection with the new stock issue recently authorized by the shareholders of the Dominion Steel Corporation and its subsidiary companies. Mr. Plummer and Mr. MacDougall will probably visit some of the steel works and collieries on the Continent, in addition to some of the English plants.

Mr. T. J. Brown, the general superintendent of the Nova Scotia Steel & Coal Co., left for England on the 13th of January.

Mr. J. Dix Fraser, general manager of the Atikokan Iron Company, Port Arthur, is on his way to England.

Mr. Martin Nordegg is in Toronto.

Mr. Allan Greenwell, editor The Colliery Guardian, London, England, will attend the Annual Meeting of the Canadian Mining Institute in Toronto.

MOUNT ROBSON

[Editor's Note:—As round Mount Robson has centred much mountain-climbing effort, and as an officer of the Geological Survey of Canada took the photograph that is reproduced herewith, we do not apologize for reprinting from that officer's report, the following description.]

Extract from Report on the Geology and Natural Resources of the Country Traversed by the Yellowhead Pass Route from Edmonton to Tete Jaune Cache, Comprising Portions of Alberta and British Columbia, by James McEvoy, B.A.Sc.

Geological Survey of Canada, 1900.

Robson Peak.—Looking up Grand Fork is the most imposing view met with on the whole route. Great mountains are on every hand, but over all stands Robson Peak, 'a giant amongst giants and immeasurably supreme.' This, as well as the following, is from the description of the mountain by Milton and Cheadle.* 'When we first caught sight of it, a shroud of mist partially enveloped the summit, but this presently rolled away, and we saw its upper portion dimmed by a necklace of feathery clouds, beyond which its pointed apex of ice, glittering in the morning sun, shot up far into the blue heaven above.' The top of the mountain is usually completely hidden and rarely indeed is it seen entirely free from clouds.

Height of the Mountain.

The actual height of the peak is about 13,700 feet, or 10,750 feet above the valley. The face of the mountain is strongly marked by horizontal lines, due to the unequal weathering of the rocks, and has the appearance of a perpendicular wall. From the summit to the base on the Grand Fork, a height of over 10,500 feet, the slope is over 60 degrees to the horizontal.

Although Robson Peak has been long known, its height has never been determined, nor was it supposed to be particularly notable in that respect, but now since the height of Mts. Brown, Hooker and Murchison have been proved to be greatly exaggerated, it has the distinction of being the highest known peak in the Canadian Rockies.

It is interesting to note that in a paper read before the Royal Society of Canada by Dr. G. M. Dawson, the following paragraph occurs:—

"The Kamloops Indians affirm that the very highest mountain they know is on the north side of the valley at Tete Jaune Cache, about ten miles from the valley. This is named Yuh-hai-has-kun, from the appearance of a spiral road running up it." The mountain referred to is undoubtedly Robson Peak, as it is only fifteen miles north from the valley at Tete Jaune Cache. The 'spiral road' is probably an Indian's imperfect description of the horizontal lines on the face of the mountain. As far as can be learned, no one, either Indian or white, has ever succeeded in reaching the summit.

The North-West Passage by Land, pp. 252-253.

BOOK REVIEWS

The Commercial Handbook of Canada and Boards of Trade Register—Eighth Year, 1912—Edited by Ernest Heaton, B.A. (Oxon.), and J. Beverly Robinson —562 pages—Stiff Cover—Price $1—British Edition, 5 Shillings—Published by Heaton's Agency, 32 Church Street, Toronto—1912.

Each successive year sees this excellent handbook assume more compendious dimensions and more comprehensive character. A list of the contents shows this:—**Official directory,** including the personnel of the Dominion and Provincial Cabinets, members of Parliament, Senate, Departmental Officials, etc.; **Corres-**

pondence, giving rates of postage, parcel post, mails, cable regulations, etc.; **Financial Information,** showing money exchange and transmission, banking information, and similar data; **Credit Reports** and **Regulations; Transportation; Customs Information,** a very full section comprising the Customs Act, Official Tariff, and much cognate material; **Description of Towns and Local Opportunities; General Information,** taking up each industry, profession, and important vocation, and including facts about climate, topography, sport, education, and so on; and a series of mercantile and financial tables.

The volume is carefully indexed.

The most remarkable feature of the Annual is its conciseness. That it has been competently edited is evident. It is given a semi-official standing from the fact that the editor has the co-operation of government officials, of the large corporations, and of many boards of trade.

American Civil Engineers' Pocket Book—Editor-in-Chief, Mansfield Merriman—First Edition, Fifth Thousand—1380 Pages—Soft Cover—Illustrated—Price $5—Published by John Wiley & Sons, New York, and the Renouf Publishing Co., Montreal—1911.

It argues a good deal of moral courage for a compiler to attempt to cover ground that has already been trodden many times. Mr. Merriman has approached his task confidently. With the aid of twelve associate editors he has produced a volume that will at least be useful, and may possibly do more than supplement the older standards. All of the usual engineering data, such as mathematical tables, are given in compact form. Twelve other sections, dealing with the main divisions of engineering, are written by specialists.

The mining engineer must often perform the work of his civil brother. The two professions overlap. In such cases he needs pocket books, reliable pocket books. The American Civil Engineers' Pocket Book is not, however, confined strictly to civil engineering. Certain phases of mining engineering are discussed. Shaft-sinking, core drilling, explosions, etc., are given a fair share of attention.

The aim of the editors has been to compile a volume "better and fuller than any heretofore published in the English language." Time will tell whether they have or have not accomplished that object. In any case they have made a laudable effort. The volume will prove a good investment for any engineer.

Stamp Milling—A Treatise on Practical Stamp Milling and Stamp Mill Construction, by Algernon Del Mar, A.R.S.M., M.A.I.M.E.—129 Pages—Illustrated—Stiff Cover—Price $2 Net.—McGraw-Hill Book Company, 239 West 39th Street, New York—1912.

This is a book written by a practical mill man. It is not trite to say that it has long been needed.

A modest introduction sets forth the author's intent, which is to give in print his own experience and the experience of others. "The sooner," he writes, "the millman recognizes that there is something to attain beyond his mere wages the sooner will the amalagamating of the precious metals be classed among the fine arts." This is something more than true.

A brief historical sketch occupies the first few pages. Then follow concise outlines of the principles of the stamp mill, of the practical working of the mill, of the limitations of the single unit and five-stamp unit batteries, and of amalgamation. The last chapter, which includes nearly half the book, takes up stamp mill construction. Frames, foundations, mortars, cams, shoes, dies, boss-heads, tappets, tables, feeders, bins, in fact, all the integral and incidental parts of the stamp mill are described and their functions outlined.

The merits of the book are that it is modern, readable, practical, concise, and quite devoid of the padding so frequently used in similar volumes. The author has been up against the real thing.

Speaking advisedly, the real literature of stamp milling, apart from the fugitive magazine article, is still to be written. Mr. Del Mar has given us a book that will form a good nucleus for future writers.

Incidentally, we notice that the Nissen stamp, a Canadian invention, is given honourable mention.

With the revival of gold mining in Canada this kind of book should be in demand. The benefit to be derived from thoroughly digesting the principles and practice of any department of mining engineering or metallurgy is not always appreciated. Stamp milling, for instance, simple as it seems in principle, is wofully misunderstood in practice. The deliberate balance that must be maintained, the fine adjustment, and the close control of all the factors, take long to learn. In fact there are but few operators who can "make music in the mill." Mechanical efficiency is only a means to an end. That end is commercial profit.

A Manual of Fire Assaying—By Charles Herman Fulton, E.M., D.Sc.—Second Edition Entirely Re-written and Enlarged—219 Pages—Illustrated—Stiff Cover—Price $2 Net—McGraw-Hill Book Company—239 West 39th Street, New York—1911.

It is the rare text-book that runs through more than one edition. We may take it, therefore, as a sign of grace that a manual enters a second edition.

Mr. Fulton's "Manual" is well known to most of our mining readers. The first edition was published in 1907. Four years have seen much change and progress in the art of assaying. The design and character of assay furnaces have been improved, as have also the routine details and the mechanical incidentals. Of these changes and improvements the author has taken full cognizance in this second edition. As with all good text-books the arrangement of the subject-matter is logical. For the benefit of those who may not be familiar with the book, it may be explained that the following subjects are treated:—Assay furnaces and tools; reagents; the assay of reagents; sampling weighing; reduction and oxidation reactions; the crucible assay and assay slags; cupellation; parting; assay of ores containing impurities; special methods; error in the assay for gold and silver; assay of bullion; assay of ores and alloys containing platinum, iridium, gold silver, etc.; assay of tin, mercury, lead, bismuth and antimony; and an appendix of suitable tables.

The illustrations are better and more numerous than in the first edition.

In size and make-up the book is practically identical with Del Mar's "Stamp Milling" and makes a suitable companion volume with the latter.

COAL MINE FATALITIES IN CANADA.

Written for the Canadian Mining Journal by F. W. Gray.

An article has been going the round of the Canadian newspapers in the mysterious and exasperating way that some newspaper paragraphs do circulate, which purports to summarize the information relating to mine accidents in Canada that is to be found in the Minerals section of the Report of the Commission of Conservation issued from Ottawa in June, 1911. The article referred to, whether purposely or otherwise, quotes in a very misleading manner from the figures given by the Commission, and makes the astounding statement that the fatality rate in Canadian coal mines is the highest in the world, and that whereas European statistics show a decreasing death rate, the Canadian death rate is increasing. Most editors who have clipped this paragraph have accepted it at its face value, and deplored the seeming apathy of Canadian mine owners and officials; while the uninformed reader, with a pathetic faith in the printed page which still lingers amongst us, has received another impression of the dangers of the mine, to add to already exaggerated ideas on this subject.

Reference to the figures furnished in the Report of the Commission establishes the following comparison between the rate of fatal accidents per thousand employees in various coal countries:

	1904	1905	1906	1907	1908
United States	3.38	3.53	3.40	4.86	3.80
Canada.	3.97	2.10	2.59	3.74	3.31
Prussia.	1.80	1.85	1.94	2.36	2.61
Great Britain	1.24	1.35	1.29	1.31	1.32
Belgium.	.93	.91	.94	1.04	1.07
France.	.89	.84	7.17	1.10	.95

It may be seen from these figures that Canada is the only country where the death rate per thousand employees showed a decrease in the period reviewed by the Commission.

In fairness to Nova Scotia a sharp distinction should be drawn between it and British Columbia. Taking the same years as in the preceding table Nova Scotia and British Columbia compare as follows:

	1904	1905	1906	1907	1908	Av'ge
British Columbia...	8.31	2.72	3.12	5.11	2.95	4.44
Nova Scotia	2.40	1.85	2.39	3.05	3.48	2.63

If the whole decade 1900-1909 is reviewed the fatality rate of British Columbia will be found to average 9.65 per thousand, comparing with 2.65 per thousand in Nova Scotia.

There are two methods of comparing the rate of mine fatalities, namely the rate per thousand employees, and a tonnage basis. On the basis of fatalities per thousand employees Canadian mines compare unfavourably with European mines, but if the tonnage basis is employed the comparison takes a somewhat different aspect. It may be regarded as special pleading to urge a comparison on a tonnage basis, but there are circumstances connected with the development of coal mining in Canada which are of a special nature, and the same is true of the United States in a more marked degree. In European countries coal-mining has become a very specialized science, and the mining of coal is done by a class of men whose fathers and grandfathers were miners before them, men whose ancestry and training have developed in them what may almost be termed an hereditary instinct. The development of the industry has been slow when compared with the phenomenal increase on this side of the Atlantic, and possibly the most striking feature is the great disparity between the rate of production per man employed in Europe compared with America.

A very suggestive article in this connection was contributed to "Coal Age" in the issue of 6th January, by J. T. Beard. In this article, after pointing out the peculiarity of American coal mining conditions, such as the influx of foreign labour, demand for coal, and rapid development of mines, the writer expresses himself as follows:

". . . . . the degree of efficiency with which the mines are managed would be properly represented on a tonnage basis. In other words, the death rate should then be expressed as the ratio of the number of fatalities to the tonnage of the mine, and not to the men employed. This seems to me a more fair basis of comparison."

and concludes his remarks by stating that—"taking the tonnage basis as the proper method of estimate, which I believe to be a nearer approximation to what it is desired to show, the death rates for these years are lower in the American than in the English mines. It will be observed that the death rate, on this basis, has uniformly decreased in Pennsylvania during this period, year by year, while in English mines the rate for the same years shows a uniform increase."

This is a bold contention, which may reasonably be objected to on obvious grounds, but, nevertheless, the article is one to ponder over. There are many reasons why the tonnage yield per man is greater in America than in Europe, but the principal cause is to be found in the differing nature of the coal deposits. Many of the coal seams in the United States offer ideal conditions for the extraction of coal at a very rapid rate. The seams are thick and of but slight pitch, and are so situated in the hill sides that haulage, drainage and ventilation problems really do not exist. It is not overstating the matter to say that American methods of extraction have been, and in many instances still are, wasteful, and that so far but little attention has been paid to thin coal seams such as are being worked in Europe. Electricity is employed underground in a manner that would make a European or a Nova Scotian engineer nervous, and it is only necessary to scan the advertising pages of an American coal-mining journal to see how wide-spread is the use of naked lights and acetylene torches. Not everyone will go so far as to agree with Mr. Beard that "the degree of efficiency with which a mine is managed would be properly represented on a tonnage basis," or that the death rate should be expressed "as the ratio of the number of fatalities to the tonnage of the mine, and not to the men employed." Nevertheless, there is much in Mr. Beard's contentions which would give rise to fruitful discussion.

In the same issue of "Coal Age" coal-mine mortality statistics are discussed by Frederick L. Hoffman, no mean authority, and he comes to the conclusion that—"the record for nearly all the states and provinces is not one which warrants the assurance that material progress is being made in the reduction of the preventable loss of life in coal-mining operations in the United States and Canada."

The following table gives a comparison on both the tonnage basis and rate per thousand, between Great Britain, Canada, Pennsylvania and the two provinces of British Columbia and Nova Scotia, all the figures except those relating to Canadian mines being taken from Mr. Beard's article previously referred to. The figures for Alberta are not included in the 1908 statement, not being available.

TABLE SHOWING PRODUCTION OF COAL, NUMBER OF MEN EMPLOYED, FATALITIES, AND DEATH RATES, AND AVERAGE ANNUAL OUTPUT PER MAN, 1908-09, GREAT BRITAIN, PENNSYLVANIA, CANADA, BRITISH COLUMBIA, NOVA SCOTIA, AND DOMINION COAL COMPANY.

		Production Tons.	Employees inside and Outside.	Total Fatalities.	Death Rate. Per 1,000 men.	Death Rate. Per million tons.	Average Annual Output Per Man.
Great Britain	1908	261,512,214	987,813	1,306	1.32	5.01	329
"	1909	263,758,562	1,013,998	1,453	1.44	5.51	323
Pennsylvania Bituminous	1908	114,937,375	181,840	572	3.15	4.9	753
"	1909	136,205,695	185,921	506	2.72	3.7	893
Pennsylvania Anthracite.	1908	83,543,243	174,503	678	3.88	3.9	672
"	1909	80,223,833	171,195	567	3.31	7.1	651
Canada.	1908	8,030,000	19,028	63	3.31	7.8	422
"	1909	9,380,000	23,708	100	4.21	10.6	396
British Columbia.....	1908	2,088,000	6,095	18	2.95	8.6	343
"	1909	2,328,000	6,418	57	8.88	24.5	362
Nova Scotia	1908	5,940,000	12,933	45	3.48	7.6	460
"	1909	5,046,000	12,083	34	2.81	6.7	418
Dominion Coal Company	1908	3,555,068	4,936	17	3.44	4.8	720
"	1909	2,736,363	3,914	13	3.32	4.7	700
"	1910	3,526,754	5,022	15	2.98	4.2	700
"	1911	3,984,749	5,499	19	3.45	4.8	725

This table shows how much greater the production of coal per man employed is on this side of the water than in Great Britain, but beyond that there is little to be proud of, particularly in the record of British Columbia. The figures given for the Dominion Coal Company's mines are conservative, and in calculating the number of men employed, only the average daily force has been taken. The actual number of employees is about twenty per cent. greater, so that the fatality rate per thousand employees is slightly exaggerated.

That aggressive weekly, the Canadian "Collier's," in commenting on mine fatalities in Canada, says: "Some day there will be a particularly shocking mining accident at Fernie or Sydney. Public opinion will be stirred, and the Government will be stimulated to action. A commission will be appointed to go to Europe to study methods of preventing accidents. The commissionerships will be very popular. A blue book will follow, and in course of time Canada will do what other nations did long ago." Your correspondent cannot speak for Fernie, but he can for Sydney, and if the prophecy of disaster that trips so easily from the editorial pen should unfortunately be ever fulfilled in the Sydney coalfield it will not be for lack of precautions on the part of those responsible for the safety of the mines, and it may do no harm to remind editorial writers that miners do not relish such prophecies. Men do not talk lightly of that which they most fear, and the mining men of Cape Breton at any rate prefer to take measures for their own safety and that of their mines, rather than wait for a commission, a body which, in the minds of most people is associated with leisurely delay and lavish expenditure.

THE NATURAL HISTORY OF HARTZ-FOREST.

Written for the CANADIAN MINING JOURNAL by J. C. MURRAY.

(Continued from the issue of Jan. 15.)

I concluded the first chapter of this review with an allusion to "the Water of a Vitriolic Nature" that pestered the miners in the Rammelsberg mine. Observations, pathological and chemical, are made by Herr Behrens. "Some People drink the Water for a Pain in the Stomach, and other Ailments, because it purges violently; yet it doth often more harm than can be repaired. 'Tis of a very nauseous taste." We can, even at this date, feel some pity for the benighted imbibers of acidulous mine-water! The effete twentieth century tum-tum would not long survive such heroic dosing. It is mentioned, by the way, that iron bars deposited in this water accumulated a covering of copper. "Iron turn'd to Copper" is the reference in the index.

Workmen's compensation and employers' liability were not live issues two centuries ago in Hartz Forest. Life may have been a serious matter, but the hereafter was the real thing. It mattered little how many widows were "made in one day." No meddling inspector, no brutal coroner, held the employer responsible. Hence the only real obligation that rested upon the operator in so far as the welfare of his men was concerned, was to see that they were not dashed unwarned or unprepared into eternity. The fate of bereaved families, naturally, mattered not at all. How simple a solution of labour troubles! How peaceful the lot of the mine owner! Thus does the author lead up to the subject: "This Mountain is hollow'd out underground into such large caverns, that they, in some places, are too high to be propp'd; wherefore 'tis very dangerous to work in some of the Mines; upon which account the Miners at Gosla are two Mornings in the Weck exhorted by a Sermon to live in the Fear of God, to be prepar'd in case of any Accident; but they are such a fool-hardy audacious Crew that when the Parson preaches a little longer than ordinary, and when the City-Gates are open, they run out o

the Church, leaving him to preach to himself.'' That God-forsaken and impious crew must have deserved any fate. Our bowels of compassion are moved when we think upon that devoted parson watching his congregation evaporate. Would not our Canadian Lord's Day Alliance have brought these abandoned miners to reason!

''Most of the Mines,'' continues the righteous observer, ''are very well propp'd and secur'd with Timber, so that it is commonly said, There is more Wood underground in Rammelsberg, than in the whole City of Goslar.'' Mighty vaults were there also, ancient places of worship dedicated to long-forgotten ''Sylvian Gods.'' ''In another part hereof is an old Mine, fallen to ruin, call'd The Devil's Mine, by reason (as 'tis said) the Devil used to work amongst the rest of the Miners, to receive his Pay every Week, and to carry away his Share of the Ore: But one day, as the Miners did not share justly with him, he caus'd the Mine to fall to ruin.''

Part VIII. of *The Natural History of Hartz-Forest* treats of metallurgical operations mainly, with incidental mention of mining. Here are directions for the traveller: ''If you have a mind to see the Mines and Smelting-houses on the Hartz . . . . you must go to a House near one of the Mines, to provide yourself with a Guide and a Miner's Dress. First you are carried to a Gabel, or Gapel, to see how the Ore is brought up from the Mines.''

The gapel, or hoist-house, was a wooden structure, sheathed with boards or slate, round at the bottom, and resembling roughly a cone. A circle of about sixty feet diameter was covered. In this was arranged a horse-whim. ''In the midle (this is the original spelling) of the Area is a deep Hole, wherein is placed a Spindle, on whose upper end is wound about the Chain which brings up the Bucket with Ore from the Mine. Lastly, there goes across thro the Spindle a Beam, to which the Horses are put. When the full Bucket is brought up to be emptied, the Man who governs the Horses drives 'em about, to let down the empty Bucket again, and another full one comes up at the same time.''

Windmills had been used. They has fallen into disrepute, however, because of the uncertainty of the wind.

In the ''Forehouse,'' or shaft-house, one could see the shaft ''which is about 5 or 6 foot square, which leads you down to the Mine, and is very well secur'd with Timber to prevent the Ground's falling in. Here you go down upon Ladders of about thirty Steps: At the Foot of each there are some Boards placed to rest upon; the Guide going first with a Candle in his Hand. If you care not to undergo this Fatigue, you may be let down in one of the Buckets.'' No bothersome restrictions in those good times! Nowadays the Ontario miner has to pay for the privilege of riding the bucket.

''The Caves, or places where the Miners dig the Ore,'' were often as high and spacious as a ''midle-siz'd Church.'' Some of the ore ''ran brittle,'' and was won with hammer and gad. In some places it was so tough that the miners were ''obliged to blow it up with gunpowder; which is done thus: They have a long and square Iron Peg, running into a sharp and harden'd Point, with this Iron they make a Hole in the Ore, fill it with Gunpowder, secure the Hole, and put a Thread that is dipp'd in Brimstone to it, which they light on the Extremity, and then run away from it''—a precaution that is even now considered wise. '' 'Tis a very pleasant sight,'' continues our author, ''to see the Miners, of which there are sometimes Thirty together working in one place, each of 'em having a Light before him, and the Ore glittering all about 'em.''

''An Adit,'' remarks the sapient doctor, ''is a Trench begun at the foot of the Mountain, running into one or more Mines: 'Ts pretty large, both Sides and the Roof are secur'd with Timber, and serve to drain off the Water, to admit fresh Air into the Mine, and to let out the noxious metallic Vapours.''

This is the last word on mining. There follow now several paragraphic descriptions of ore-dressing and smelting methods. ''To save the expence of Wood and Coals'' the impure ore is ''stamp'd and wash'd upon the plain Hearth, which is made with several Boards placed in the position of an inclining Plane, to separate the Stone from the Metal.

''The Stamping-Mill-House is a long and broad, but low Building, divided in the midle by a Wall; one Side of the House serving for the stamping, and the other for the washing of the Ore.''

The ore was fed into a strong iron-lined trough. Here it was stamped either dry or wet, as the nature of the Ore requires. The Stamp-Hammers, or Pestles, are lifted up by a Wheel, and, to encrease their Force, there is to the bottom of each of 'em fixed a flat piece of Iron of 50 l. weight.

When stamped dry, the ore was passed through a sieve or a Brass Cullender; but when stamped wet it was laundered into a brass vessel with a wire bottom. Thence the crushed material went into ''another Trough, where 'tis wash'd so long, till all the stoney Particles are separated from it.

''What remains in the first Trough is clean'd in the following manner: In the other partition of the Building there are several inclining Plains, or plain Hearths, which are cover'd with coarse Linnen; the Ore in pouder, just now mention'd, is put upon the upper end, and the Water running upon it, 'tis wash'd down from one Plain to the other, till at last all the metallic Particles subside to the Linnen, and the Stone is carried by the Water into the Troughs at the foot of these inclining Plains; but as this carries still some Metal with it, they let it run from thence into large Reservoirs, where they allow it time to settle: And when they have no Ore to stamp, they put it again under the Stamp-Hammers, to wash it as before, to separate the Metal entirely from the Stone.

''The Ore subsiding upon the uppermost Board of the Plain Hearth is pure Metal, but that of the second, third, etc., is wash'd over again.

''This Labour is perform'd by little Boys and Girls.'' All of which goes to prove that our predecessors knew something about the commercial aspects of ore treatment. The flow sheet signified above probably implied an effective, cheap and suitable method of milling the Hartz-Forest ores, and certainly the labour could not have been exorbitantly costly.

We now come to considerations metallurgcal. The roasting ovens stood, with all the other reduction equipment, in one large building. ''The Oven is made exactly like a Baker's Oven, only bigger: Herein they make a Fire with split Wood, and sling the last washings of the stamp'd Ore in it; then burn it twelve hours, to clear it of the unripe, volatile and poysonous metallic Particles; for otherwise both the good and bad would fly away in Smoak in smelting.'' Part of the sulphur was condensed, purified, and made into the brimstone of commerce. Open heap-roasting was also resorted to.

Of smelting ovens there were numberless varieties. The author points out this fact and, very astutely, refuses to describe any of them. The refining oven is, obviously, a large cupel. "When the Oven, and Coppel that stands in it, are duly heated, the Refiner puts the Metal upon the Coppel, and encreases the Heat till it flows; then he scums off the Flakes, and the remaining Impurities are carried away by the blowing of the (hydraulic) Bellows, which are directed upon the Metal when it stands in Fluss.—This operation is practis'd only upon Silver and Gold."

Further purification of silver was effected in a muffle, after which it was cool'd in a pail of water.

For coinage purposes the refined silver was melted in a crucible, alloyed with copper, cast into long ingots, and cut into discs the size of the coin required. The metal was then cleaned and stamped. The latter process was affected by a sledge-hammer and man-power, or by horse-driven machinery.

On the "Refresh-oven," the "Seiger or Streining-Oven," the "Darr" and the "Defting-Oven," time does not permit us to dwell. Nor may we touch on the "Copper-Mill," or the "Brass-Houses," or the "Vitriol-Houses," or the "Iron Smelting-Houses," or the "Glass-houses."

The caption of the concluding Part IX. reads: "Of some other Remarkable Things in and near Hartz-Forest." In this category fall both Dr. Behrens and his translator.

THE McKENZIE GOLD MINE

(Extract from Report of the Chibougamau Mining Commission.)

This property of "The Chibougamau Gold and Asbestos Mining Company" is on a southern hillside of Portage Island, 125 feet above Lake Chibougamau.

More work has been done at this place than anywhere else in the district; this work consists of a clearance of the surface and many cross-cutting trenches in earth and rock, at short intervals. There is about 1,000 feet of trenching altogether. This is distributed over 25 cuts and pits; also there is one shaft 35 feet deep; the cuts are up to 12 feet deep. The greatest apparent dimensions of the mineralized area are 700 feet long by 100 feet wide. Neither workings nor rock exposures indicate further extensions.

Within this area are large masses of quartz, as shown on the plan of this property. This quartz is somewhat mixed with masses of green schist, patches of oxides and a scattering of copper and iron pyrites. The oxidized portions show very minute colours of free gold in some cases when panned.

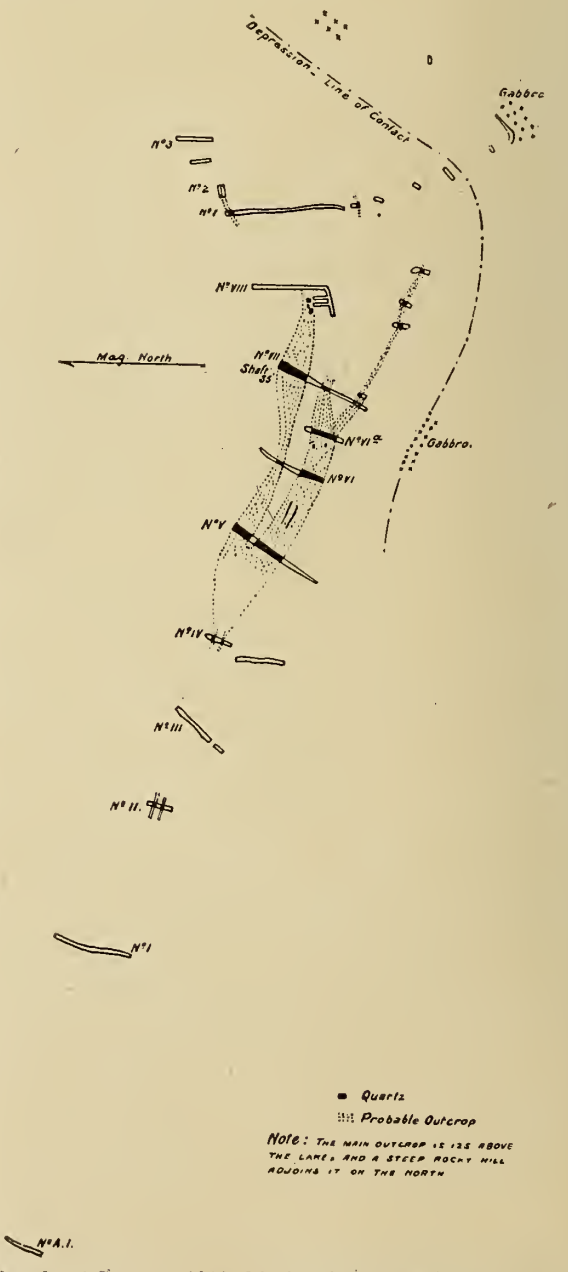
These quartz occurrences are most irregular; they are in masses, slabs, spurs, and veins, intermixed with the schistose country rock, a Keewatin diabase near its contact with gabbro.

The quartz shows a disposition to trend with the schists or across them on joint planes; the schists dip steeply southwards, the joint planes lie nearly flat, slightly inclined towards the north; this condition is illustrated by the cuts and by the shaft sections.

Surface erosion wearing down to one of the flat lying masses of quartz would be arrested by its resistance, and so, large outcrops, such as the one at the shaft, would be formed. Other similar masses may recur at depth.

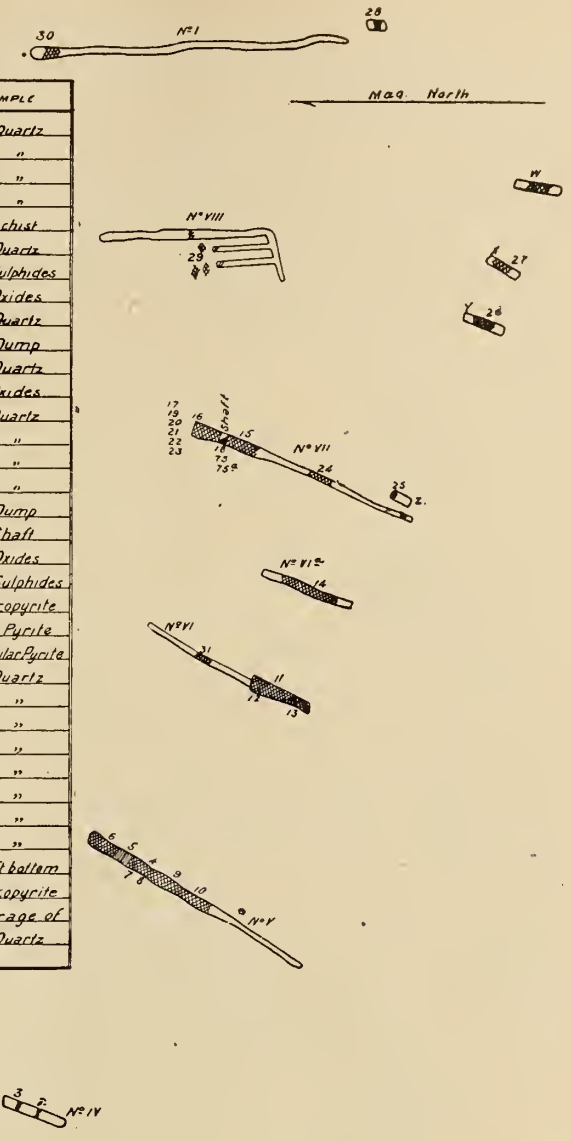
Under such conditions no great dependence can be placed upon the surface section. I estimate the total outcrop of quartz, as it exists in workable sizes as veins, spurs, and segregations, through the schist, at an average total width of 35 feet by 300 feet long. This would give about 800 tons of quartz for each foot of depth.

The largest continuous outcrop of quartz occurs in, and is cross-cut by, Cuts V and VI and VII, as numbered by Mr. Dulieux. These are the same cuts as B, C, A, of Mr. Hardman's report. In Cut V quartz is almost continuous across 50 feet; in Cut VI, 21 feet; in Cut VII, 32 feet. This band appears to be continuous from a little west of Cut V to a little east of Cut VII, a distance of at least 300 feet. This then is the heart of the deposit, as far as surface appearances go; the quartz outcrops on the west, northeast, and southeast extensions are com-

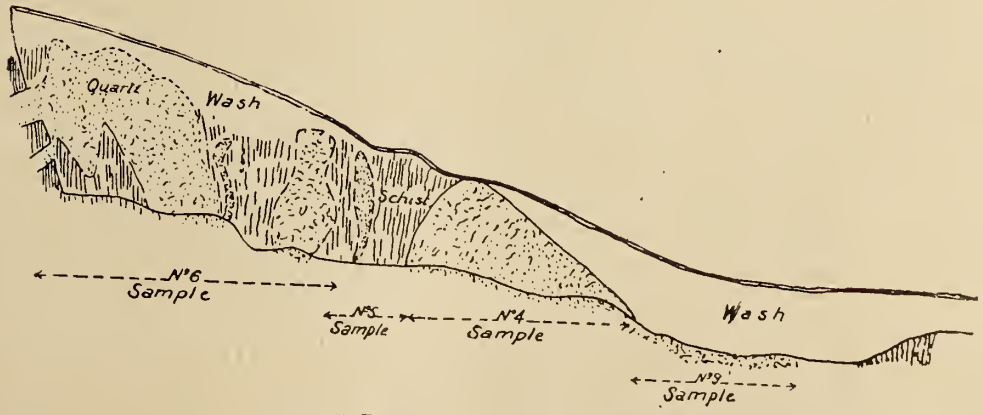


—Sketch of Survey, 1910, McKenzie Gold Mine, Portage island. Scale: 200 feet equals 1 inch.

No	Gold oz	Silver oz	Copper %	Sample
1	None	None		2.5' Quartz
2	Trace	Trace	None	2.5' "
3	None	None		4' "
4 x	0.14	0.60	1.19	17' "
5	0.19	0.46	0.47	7' Schist
6 x	0.04	Trace	0.18	19' Quartz
7	0.16	0.20	14.68	Sulphides
8	0.14	0.21		Oxides
9 x	0.07	0.45	1.16	13' Quartz
10 x	0.12	0.20	1.15	Dump
11 x	0.04	Trace	0.18	21' Quartz
12	0.15	0.21		Oxides
13	0.66	0.32		1' Quartz
14 x	0.10	Trace	0.22	25' "
15 x	0.07	0.31		15' "
16 x	0.32	0.25	0.10	12' "
17 x	0.09	Trace	0.38	Dump
18 x	Trace	Trace	0.36	8' Shaft
19	1.77	0.79		Oxides
20	0.37	0.51		Sulphides
21	Trace	1.20	3.10	Chalcopyrite
22	0.25	0.51	6.40	Iron Pyrite
23	2.00	0.66	0.94	Granular Pyrite
24 x	0.04	0.16		8' Quartz
25 x	0.03	Trace		2' "
26 x	0.05	Trace		5' "
27 x	Trace	Trace		6' "
28	None	None		1' "
29 x	0.09	0.32	0.29	20' "
30 x	0.02	0.15	2.24	6' "
31 x	0.07	Trace		6' "
75	0.06	Trace	0.20	Shaft bottom
75a	Trace	1.50		Chalcopyrite
General of Nos	0.106		0.524	Average of 185' Quartz



—Assay Chart. McKenzie Gold Mine.
Scale: 80 feet equals 1 inch.

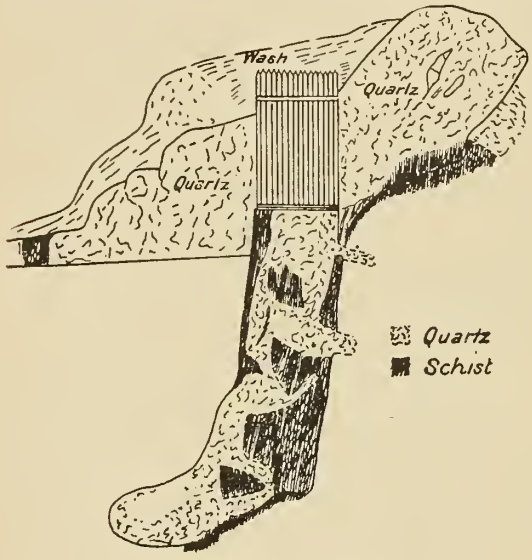


Side View No. V Cut, looking Eastward.

paratively of little size or importance.

Nine days were spent in the sampling and examination of this property. Thirty-four samples of average and particular character were taken, to find the values of measured exposures and of the various classes of ore.

A duplicate final sample of these assays marked (*) was taken and placed in a common lot, which was reserved for a free milling assay, and control average. This general sample assays gold 0.07 ounces, and is 47 per cent. free milling.



—McKenzie Gold Mine.

No. VII Open Cut and Shaft, looking Westward.
Scale: 15 feet equals 1 inch.

The quartz ore body begins on the west, in Cuts II and IV, as small occurrences of very low grade quartz, it swells out to a great mass of greater value about Cuts V, VI and VII, then fades into two divergent, lesser bodies, of very low grade, one which passes northeasterly across the north ends of Cuts 1 and 2, east; and one which passes eastwards from the southern end of No. VII trench.

Samples numbered 4, 6, 9, 10, 11, 14, 15, 16, 17, 18, 24, 25, 26, 27, 29, 30, 31, are general samples which cover most of the chief exposures; they represent 217 lineal feet of quartz when added together, only one of them assays more than $3.00 in gold, the greater mass of this quartz goes between $1.00 and $2.00, gold value. The assay of the general sample of 1-lb. duplicates from these 17 cases, assays: gold, 0.07 ounces or $1.70. A computed average of the same individual assays gives gold $2.12; copper, 0.524 per cent.

—McKenzie Gold Mine.

No. VII Open Cut and Shaft, looking Eastwards.
Scale: 15 feet equals 1 inch.

THE PETROLOGICAL DEPARTMENT

By G. S. SCOTT

This department has been arranged with a view to aiding those of our readers who are far removed from facilities for making microscopic and other laboratory examinations of rocks and ores. Thin sections will be cut from specimens received and the results of their study briefly given in the following number of the Journal. No charge will be made, except 35 cents to cover the cost of making the thin section in each case. Samples should be about the size of an egg and as fresh as possible. A few notes on the occurrences of such is required. Mention should also be made of any theory or inference held by the collector, so that evidence bearing on it may specially be looked for. Address the Petrological Department, Canadian Mining Journal.

1. Swastika, J. R. J., Quartz Porphyry.—The hand-specimen of this light grey rock has a striking resemblance to a fine grained granite with little or no dark minerals. Examination of the thin section, however, shows that it consists of a matrix of microscopic grain, through which are scattered large phenocrysts of quartz, orthoclase, plagioclase, and chlorite, the latter representing original biotite. It is, therefore, a biotite quartz porphyry. The matrix is made up of minute grains of the same minerals, chiefly quartz and feldspar; and contains no glass. Pyrite with a little magnetite is abundant in cubes and irregular grains. In practically every case it is associated with the chlorite. Only a small amount of it appears to be primary. The feldspars are fairly fresh. There is no evidence of crushing or of any other alteration except that due to atmospheric agencies. This rock is comparatively recent in comparison with the other rocks of the Swastika district, and, unless the specimen were chosen from close to the contact, the fineness of the ground mass indicates that it must form a small body.

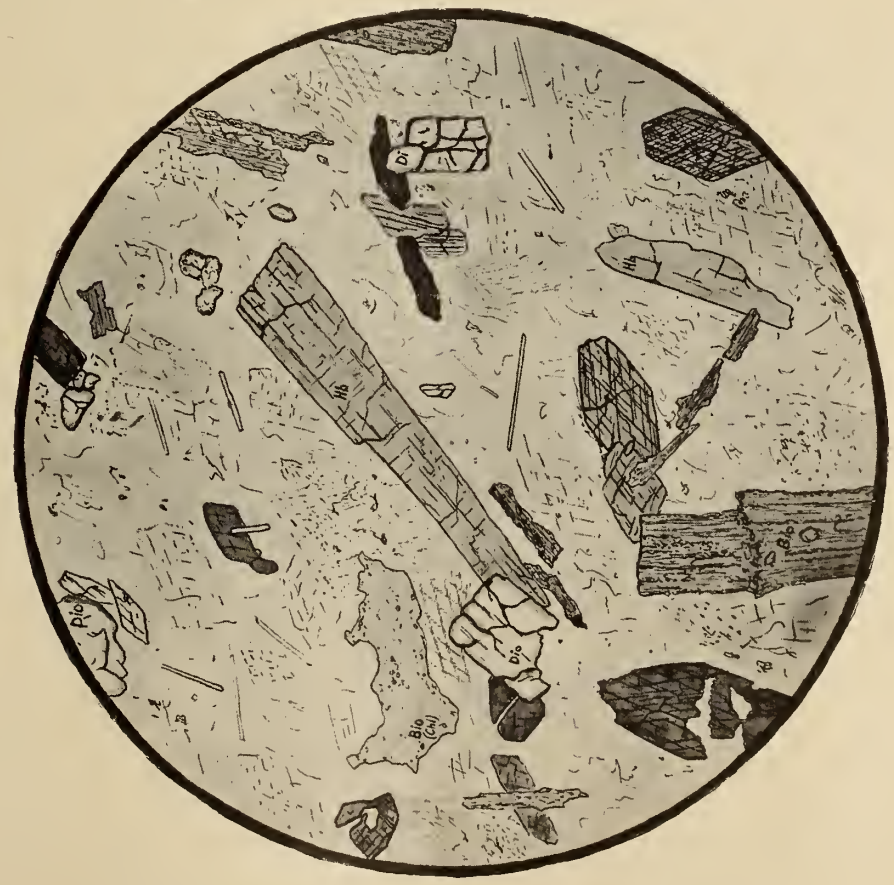
2. H. R., J. R. J., Porphyry.—Under the microscope this compact dark red rock is seen to consist of large

crystals of feldspar lying in a fine grained matrix of the same mineral. It has suffered much from crushing and now contains many streaks and nests of calcite, probably derived from the crushed parts of the rock, as the uncrushed parts are quite fresh. It is well known that acid plagioclases, such as are present in this specimen, yield more calcite upon decomposition than do the basic ones which contain more lime. Several of the calcite areas exactly resemble in form the biotite plates common in porphyries. But the connection may extend no farther; the writer does not know of any case on record where biotite has been replaced by clear carbonate with sharp outlines. A few shreds of chlorite are the only other possible indication of biotite. Several zirkons and apatites are visible. There is no trace of the rock having ever been subjected to metamorphic processes.

3. H. R., 1112, Deloro, J. R. J., Graywacke Schist.—This is a fine grained dark green rock, distinctly schistose but not cleavable. The thin section shows that the rock was originally an ordinary graywacke (consolidated feldspar-quartz-clay sediment) and has since been subjected to conditions which have induced partial re-crystallization of its constituents. Thus a large amount of chlorite and much new albite have been formed. The parallel arrangement of the chlorite scales is responsible for the schistosity. Scattered throughout the slide are small rutile needles. These are characteristic of all slightly metamorphosed argillaceous sediments such as slate, phyllite, graywacke, and graywacke schist. The conditions of metamorphism referred to were moderately low temperature and pressure—both probably due to burial within the earth's crust. Had this burial been deep enough and the temperature and pressure correspondingly high, a garnetiferous biotite gneiss with little or no schistosity would have resulted.

27. M. G. E., Swastika, Hornblende Minette.—The gray speckled hand specimen is characterized by slender hornblende needles averaging one-eighth in length and a few glistening plates of chlorite. In a coarse hypidiomorphic aggregate of orthoclase and plagioclase lie phenocrysts of hornblende, biotite (now chlorite), and a few stout prisms of diopside. Apatite is an abundant accessory. While the biotite has completely changed to chlorite with epidote, carbonates and rutile, the other constituents are quite fresh. Minette is the commonest member of the so-called "dike rocks." This class of rocks is distinguished by a composition abnormal in comparison with that of the parent magma, and as a rule the representatives are found in dikes,—but not necessarily, nor are all rocks in dike form "dike rocks." The accompanying illustration shows the appearance of this rock under the microscope.

E. B. H., Porcupine, Carbonate Phyllite.—This rock is distinctly schistose and the section shows that the chief minerals are carbonate, chlorite, albite, sericite and quartz. Part of the carbonate forms sharp sided rhombs and is, therefore, either dolomite or ankerite, as calcite never occurs with crystal boundaries in such conditions. A few quartz and feldspar grains are apparently relics of the original calcareous sediment from which this rock was probably formed. Rutile needles are abundant. The moderate degree of metamorphism exhibited is about the same as shown by most rocks from the Porcupine district.



Hornblende Minette, Swastika, Ontario, X50

THE CONSOLIDATED OPHIR MINES, LIMITED

Lake of the Woods, Ont.

(Written for The Canadian Mining Journal.)

The revival of interest in gold mining in Ontario and the recent issue by the Ontario Government of the Charter of The Consolidated Ophir Mines, Limited, make the contribution printed below exceedingly opportune. The work on the Ophir Mine by the English Syndicate, which Mr. McMicken described, was restrained by an injunction issued by the late Mr. Justice McMahon. The British investors, finding that they were liable to become involved in a costly constitutional struggle, abandoned their work and left the country and for about a quarter of a century capital for gold mining in Ontario could not be secured.

The titles upon the faith of which the British investors proceeded, were issued by the Federal authorities at Ottawa on the supposition that the lands granted had been included in an Indian reserve. This reserve was surrendered by the Indians to the Dominion Government in trust to sell, and, relying on the Federal jurisdiction over Indians and lands reserved for Indians, the Dominion Government sold and patented the lands.

The Province of Ontario, however, claimed sovereign rights over these lands and absolute ownership and granted the lands accordingly, vesting undivided interests in the various claimants, the amount of the interest of each being determined by considerations of equity,

The area dealt with by the Province of Ontario included the lands previously patented at Ottawa, and the same lands having been thus granted by different Governments to conflicting claimants, the Ontario Mining Company which had acquired a Dominion patent, attacked the Ontario grants in the Courts.

The Judicial Committee of the Privy Council sustained the Ontario Courts in upholding the Ontario grants and in declaring the Dominion patents void, and thus wrote the last chapter in the history of the bitterly fought Constitutional contest between Sir John Macdonald and Sir Oliver Mowat in regard to the nature of the Indian title.

While this question has been finally settled as far as Ontario is concerned, a similar dispute has arisen in British Columbia. In Ontario a surrender by the Indians of their title was considered necessary before the Crown would deal with any lands. The same principle was adopted in Manitoba, Alberta, Saskatchewan, and the Northwest Territories. The Province of British Columbia, on the other hand, denies the Indian title and claims to be empowered to deal with lands in the province without any surrender of the Indian title thereto.

The Indians have petitioned the Imperial Government asking that the dispute be referred for decision to the Judicial Committee of the Privy Council, under Lord Brougham's Act.

As the Imperial Government, which pledged the honour of the Crown to the Indians, the Dominion of Canada, which has exclusive jurisdiction over the Indians and lands reserved for the Indians, and the Province of British Columbia, which has exclusive jurisdiction over property and civil rights in the province, are all concerned, the constitutional questions involved are interesting and their solution will be followed by far-reaching consequences.

Meantime it is important that it should be generally known that all these questions, as far as Ontario is concerned, were finally and forever settled by the Privy Council in November, 1902.

As was naturally to be expected, it took several years after the title to the Ophir was established, to restore confidence. and it was not until about two years ago that capitalists from the United States became interested in the Ophir property and proceeded with its development. The shaft which had been commenced by the Canadian Pacific Exploration Company was continued to a depth of one hundred feet and considerable drifting done. Besides the main vein, which is known as the Ophir vein, a number of other veins parallel to the Ophir have been proved, nearly all of which carry values. Development work was done on the Ophir vein which shows up well. At the depth of one hundred feet there is a width of vein matter of thirty feet. Some of the ore is rich, showing gold in many places; but, what was more important, the average is very satisfactory, showing what is described as "a good, profitable, working grade of ore."

A charter was granted in January, 1912, by the Ontario Government to a company with an authorized capital of five million dollars, formed to operate the Ophir and some surrounding properties which have been quietly secured by the same interests during the past year. The name of the company is the Consolidated Ophir Mines Limited. As soon as its organization is complete, mining operations on a large scale will be pushed. Electric power from Kenora, where the waters of the Lake of the Woods drop into Winnipeg River, will be utilized.

Mr. H. G. McMicken, formerly of Winnipeg, but now of London, England (who is a son of the late Honourable George McMicken), was one of the pioneers of the District and he has written from personal knowledge the following:

The History of the Ophir Mine in the Kenora District.

In 1880 some prospectors found gold bearing quartz on Hay Island. They sent Jacob Hennessy into Winnipeg to get somebody to take hold of the property. Hennessy came to me and I with a Mr. McLean, Hennessy, and Mr. Doupe, a surveyor, went to the Lake of the Woods to take up the claim. As there was no railroad there at that time we had to go by canoe, which took some days. As we were paddling up to the Island we saw a canoe leaving it and found on landing that it had been taken up. A surveyor, D. B. Davidson, happening to come out to Rat Portage, as Kenora was then called, after Hennessy left, the others took him out and staked the claim. We then started for Rat Portage and landed on what is now known as Sultana Island to cook our dinner. While there we found a vein of rich looking quartz and prepared to survey the location. We ran a line probably three hundred yards but decided to go to Rat Portage for the night, as we were but seven miles from it and needed some supplies. In the morning we found that it had turned very cold

in the night and the lake was frozen, so we abandoned the idea of any more survey, and as we could not get back by canoe we had to walk from Rat Portage to Cross Lake, where we got a work train for Winnipeg.

On June 17th, 1881, Charles Moore, Hennessy, and Gadboy applied for X42 and X43, surveyed by O. B. Davidson. This is now known as the Sultana mine. Hennessy applied for a patent but could not get it. In the winter of 1882-1883 I made arrangements with Messrs. Snow, Hanan & Colwell to survey the balance of the island and we would divide it into eight interests, of which Snow was to have one-eighth, Hennessy one-eighth and myself one other eighth. Four-eighths were to be used for development and other purposes.

One-eighth was allotted to McDonald, Tupper, McArthur and Dexter, prominent Winnipeg lawyers, for their services in attending to any legal affairs.

Application was made for this property, but the Ontario Government informed us that they had nothing whatever to do with it and could not deal with it because it was claimed as an Indian Reserve by the Federal Government. We then made application to the Indian Department of the Federal Government and they told us that until the Indians released their rights to the Government nothing could be done. I then made arrangements and got up a pow-wow with the Indians and got their releases. We then applied again, but were told that there was no way at that time that the property could be dealt with.

In 1883 Sir John Macdonald, then Prime Minister of Canada, visited Winnipeg, and I interviewed him on the subject and asked him if arrangements could not be made to get the Government to deal with the property. He stated this could be done, but would make no promise. I told him I did not ask him to make such promise. The only thing I asked was that on his return to Ottawa he would look carefully into the whole matter and I felt sure that with the information he would find he would cause some kind of arrangement to be made so that the property could be handled. This he said he would do.

Nothing, however, was done until I received word from Ottawa that the Government had passed an Order-in-Council dealing with mineral lands other than coal on Indian Reserves. This was the result of my interview with Sir John Macdonald. I found on studying the regulations that anyone after its date could take the property up in 40 acre lots only. This necessitated change in our plans. So taking a number of my friends from Winnipeg and Rat Portage, I hired a surveyor and we all went to camp on the island for two weeks and surveyed it into forty-acre claims or thereabouts.

These regulations, in which I take a fatherly interest, are printed in the appendix to McPherson & Clark's Law of Mines in Canada. One of the authors of this book was Mr. J. Murray Clark, K.C., of Toronto, who was the successful counsel in the Ophir fight before the Privy Council.

Application was made to the Ontario Government in the name of Mrs. Margaret Geerie for the whole island except the Sultana claims.

I at once commenced a vigorous prospect of the locations and discovered rich deposits of gold. Mining men from all parts of the United States, Canada and England began to flock to the country. Everybody wanted to get an interest in the property and among them Mr. Caldwell, the present owner of the Sultana. He finally prevailed upon me to allow him an interest in the Ophir, which I did. He was so impressed with the showing that, not being able to control the Ophir, he made arrangements to buy the Sultana claims.

I made a deal with an English syndicate, who developed the Ophir property, and they sent out their expert and commenced operations. But Mr. Mather, of Ottawa, under an old timber lease or license, obtained an injunction after they had sunk a shaft about 35 feet. The English syndicate notified us that if we would protect them and get title and carry out our part of the contract they would go on with the work, but there were other influences at work to prevent this being done. I insisted on faith being kept with the English syndicate, but was not backed up in this by the others concerned, who desired to deal with other people. Then there was a squabble among those interested and, as shortly after I had to come to Toronto, I gave a Quit Claim of my interest in the property to the Ontario Mining Company, which had been formed by Mr. Caldwell and his friends. In this Mr. Caldwell was associated with Messrs. Alloway & Champion, financiers, of Winnipeg.

Nothing further was done with the property for some years, when some Ottawa people staked out the richest part of the island and applied to the Ontario Government for three claims of forty acres each. All parties were brought before the Ontario Government and there was a tremendous fight lasting for several years. Finally the Ontario Government divided up what was originally the Ophir with the eight adjoining locations, making in all about 440 acres. The Ontario Mining Company, instead of perfecting the title, brought a suit to set aside the grants by the Ontario Government, and thus starting the famous Ophir litigation which went through to the Privy Council. A company was formed, called the Sultana Ophir Mining Company, to which all the interests were transferred and as the company was willing to protect the original prospectors and to proceed with the development of the property, I naturally backed its claim which succeeded before the Privy Council.

The title of the Sultana Ophir Mining Company is a Torrens title, which means that any person making a claim adverse to the certificate of title would have to refer to what is known as the Assurance Fund Act, and could not disturb the holding of the Sultana Ophir Company or their purchasers under the Torrens title.

The value which those holding the Dominion title and in fact all parties attach to the property, can be indicated by the desperate fight that was made, the case having been carried to the Judicial Committee of the Privy Council, and I think that in the whole fight over one hundred thousand dollars has been spent in costs.

The appeal to the Privy Council from the Supreme Court of Canada was argued in the year 1902. In the record of the proceedings of the Privy Council the case was stated to be between the Ontario Mining Company, Limited, plaintiffs and appellants, and Edward Seybold, Edmund B. Osler, J. W. Moyer, Elizabeth Johnston, Edward H. Ambrose, John W. Brown and John S. Ewart, defendants and respondents.

Edward Seybold is a successful manufacturer of Ottawa, and represents a syndicate there. E. B. Osler, M.P., is well known in the public life of Canada. He has since sold out his interests in this property, and it is understood his interests are now held by English investors. Mrs. Johnston has transferred her interest to the National Trust Company, which company has

tario Act, known as the Sultana Ophir Mining Co., sold this interest to a company organized under the On- Limited. John W. Brown represents the J. J. Nill interests at Winnipeg. J. S. Ewart, K.C., is a well-known barrister of Ottawa, who took a prominent part in the deliberations at The Hague last summer. So, altogether, the litigation concerning this one mine in the Rainy River District, namely the Sultana Ophir, has been a celebrated case involving many prominent men and large financial interests.

In the early days of the Ophir mine development, many men in Winnipeg, prominent in public life, were interested. The original solicitors for the company that proposed to take over the Ophir mine, were Macdonald and Tupper. They were lately succeeded by Hough & Campbell and Heber Archibald. Among the men who signed the papers connected with the incorporation of this company were: J. F. Caldwell, M. T. Hunter, A. C. McMicken, A. T. R. Blackwood, C. S. Hoare, Hon. H. J. Macdonald, George Heenan, J. A. Kirk, B. H. R. Wainwright and J. Fred Snow.

ANNUAL REPORT OF THE COAL MINES BRANCH, ALBERTA

(Continued from last issue.)

LETHBRIDGE DISTRICT.

Royal Collieries, Ltd., Lethbridge.

During the past twelve months extensive alterations have been made on the surface plant of this mine. The tipple has been rebuilt and a rotary dump installed capable of handling four cars at one time. A rubber belt conveyor 28 inches wide by 34 ft. long has been erected by the Robins Belt Co. The screens are arranged for three sizes of coal. A Jenckes hoisting engine of a capacity of 300 h.p. has been installed for hoisting the cars from the bottom of the slope to the tipple. A compound air compressor has been installed by the Canadian Rand Drill Co. Considerable development has been done in the underground workings during the past year.

Diamond Coal Co., Ltd., Diamond City.

The following plant has been installed at this mine during the year 1910. A Sirrocco fan 90 inches in diameter capable of giving 100,000 cubic feet of air per minute with a six inch water gauge. The fan is driven by a 75 h. p. motor. The foundations for fan and motor are built of concrete and also the adit from the fan to the mine entrance a distance of 70 ft. A compound two-stage Reidler air compressor with Whitworth governor and Reidler valves has been installed. A battery of Babcock & Wilcox boilers has been erected fitted with B. & W. chain grates and automatic stokers. A Weir boiler feed pump 7½ in. x 5 in. x 6 in. with a capacity of 100 gallons per minute has been installed. A duplex Fairbanks service pump has been installed for pumping water from the river into the water tank at the plant. This pump is 10 in. x 4 in. x 10 in., with a capacity of 108 gallons per minute. A five-feet reciprocating feeder has been added to the screening plant. A power house and boiler house built of brick on concrete foundations have been erected. The electric coal cutting machines underground have been replaced by punchers.

Lethbridge Collieries, Ltd., Kipp.

This company controls about fifteen square miles of coal lands and it is intended to erect a plant for 1,500 tons per day. The two shafts have been sunk to the coal which is at a depth of 573 feet from the surface. The hoisting shaft is 17½ ft. x 21½ ft. in the clear. The second shaft is 10 ft. x 20 ft. Both shafts are dvided into three compartments and timbered with 10 in. x 12 in. timbers at 3 ft. 10 in. centres with 3 in. lagging. The plant at present at this mine is only temporary consisting of two Jenckes hoisting engines of 50 h. p. each. Two Sullivan air compressors, one Allis-Chalmers generator connected to a 12 h. p. Ajax horizontal engine, two 150 h. p. Robb-Mumford boilers have been installed. A temporary wash-house has been built. All shots are fired by means of the electric battery, the explosives used being dynamite. Electric lights were used underground during sinking operations.

TABER DISTRICT.

Alberta Consolidated Coal Co., Ltd., Taber.

The output at this mine has been increased and development pushed ahead so that it will be able to produce a still larger output next winter. A Fairbanks railway, track scale has been installed.

Rock Springs Sootless Coal Co., Ltd., Taber.

During the past year the following plant has been installed at the mine operated by this company: One straight-line air compressor built by the Canadian Rand Drill Co., a Fairbanks duplex pump with a capacity of 100 gallons per minute has been installed at the river for pumping water to the plant. A wash-house fitted with lockers has been erected. A rotary dump with a capacity of 300 tons per day has been installed. Ingersoll punching machines are in use at this mine.

There are several other small mines operating during the winter months in the Taber District but as the demand is purely local they close down for a number of months during the summer. The Belly River mine, operated by G. Erickson, has been equipped with a 25 h. p. gasoline engine for hoisting coal up an incline of 800 ft.

A number of small mines are operating in the Grassy Lake District and a considerable amount of prospecting is being done.

There are a number of mines operating in the Medicine Hat District, chief of these being the mines operated by the Red Cliff Brick Co., Ltd., and the Ansley Coal Co. The latter company put down two drill holes on different parts of the property with the result that

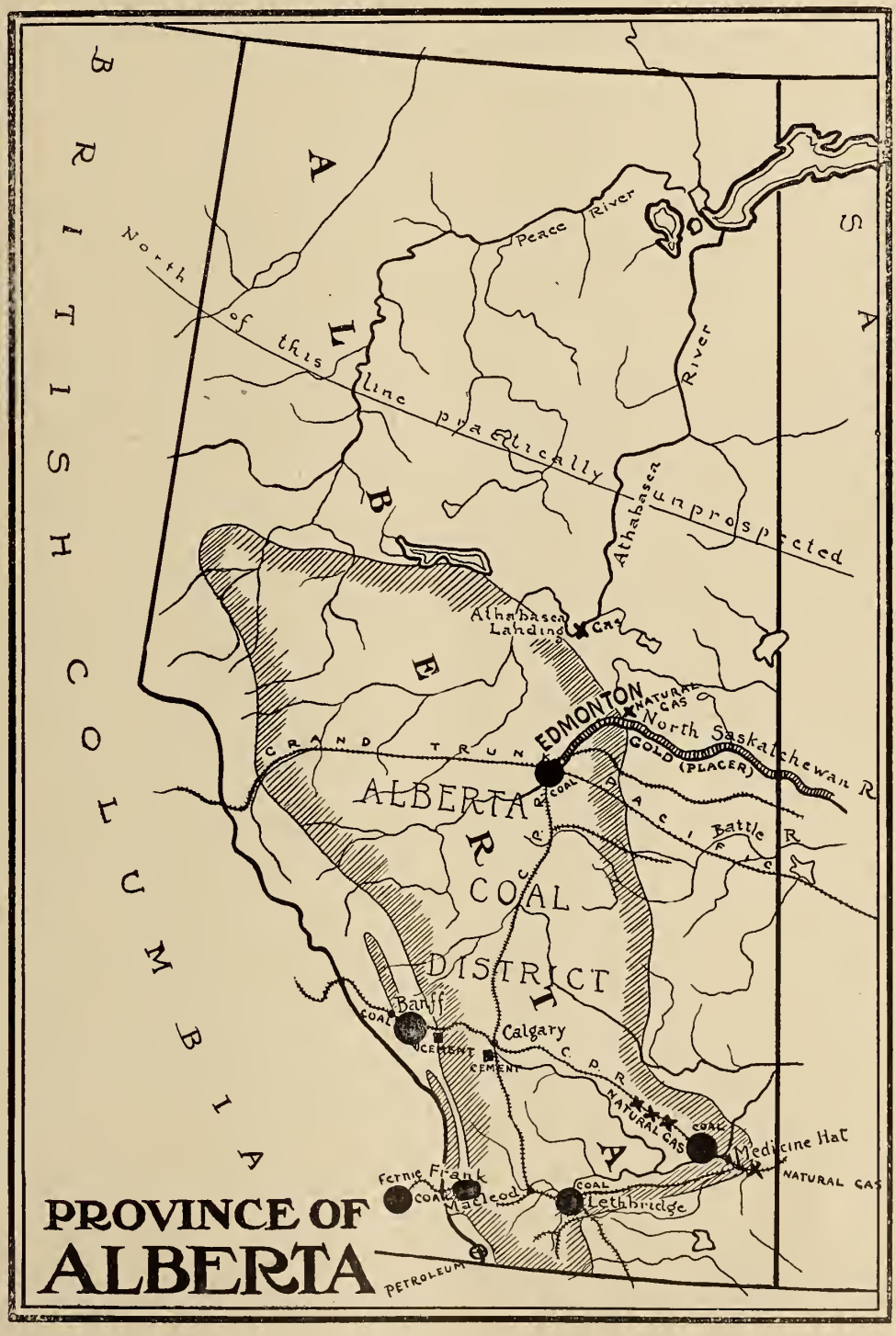
a seam of coal 7 ft. thick was found at a depth of 250 ft. from the surface.

A number of small mines are also operating in the Little Bow District but as the demand here is also purely local they only operate during the winter months.

WORK OF INSPECTION.

The inspection work of the province has increased considerably during the year 1910. A large number of new mines have been opened up, and as most of these are in the outlying districts at a considerable distance from the railway a large amount of time is taken up by the inspectors in travelling. In the larger mines, especially in the Crow's Nest Pass District, the outputs from the various mines have considerably increased, and it is consequently necessary to have much more rapid transportation for the coal. In order to obtain this a number of compressed air locomotives have been installed and a higher speed of transportation obtained, making it necessary for a more thorough inspection of the haulage roads to be made owing to the greater liability for accidents.

The "Eight Hour Law" which came into force on April 1st, 1909, and which also includes the persons engaged in transportation, is now working fairly satisfactorily, but I am of opinion that owing to the largely increased output which has to be hauled over an increased distance and entails more rapid transportation



more danger is to be apprehended. All fatal and serious accidents have been investigated and all inquests attended. The inspectors have made their rounds of inspection as often as was possible and have thoroughly investigated the cause of all accidents, and as far as practicable have had the causes of these accidents removed.

I am pleased to report that safety lamps have been installed in all the mines in the Crow's Nest Pass District, with the exception of Bear Valley Mine, operated by the West Canadian Collieries, Ltd., at Lille. Permitted explosives are now being used for blasting coal in all mines where gas has been found, and in a large number of cases Samsonite is used for blasting rock. We have had considerable trouble in getting these permitted exposives put into use, but the different persons interested are beginning to see the advantage of using them, and I believe before the end of the present year only permitted explosives will be used in mines where gas has been found.

A telephone has been established to connect the inner workings of No. 2 mine, operated by the International Coal & Coke Co. at Coleman, with the surface and has proved to be a great advantage.

A gob fire broke out in the old mine at Frank on 11th day of November, 1910, above 71 angle. This fire was dealt with by building stoppings across the main and counter gangways, and thus excluding, as far as possible, air from the seat of the fire.

I am also pleased to report that shot firing has been reduced as far as possible in a number of mines, more particularly in the Nos. 2 and 4 seams at Coleman. No shots are fired in No. 2 seam except in some of the pillars near the outcrop, and in No. 4 seam no shots whatever are fired. In a number of the other mines shooting off the solid has been discontinued and a proper system of mining coal adopted. The breast system of mining coal was adoped in the shaft mine, operated by the Canadian Coal Consolidated, Ltd., at Frank, and was considered by the inspectors to be dangerous. Action was taken by the department in connection with this matter under Section 48 of The Coal Mines Act, and I am pleased to report that before it was necessary to put the matter before a board of arbitration the company abandoned this method and is now opening out its mine on the angle system.

Proceedings were taken by the department against the West Canadian Collieries, Ltd., for violation of Section 6 of The Coal Mines Act, and a conviction obtained. The company was fined $20 and costs. Acting on instructions received from the department, the West Canadian Collieries, Ltd., instituted proceedings against a miner, Charles Germain, for having lucifer matches in his possession in the Blairmore mine where safety lamps are in use. Germain pleaded guilty and was fined $10 and costs. The Bankhead Mines, Ltd., took proceedings against a miner, John Belish, for a contravention of The Coal Mines Act by passing a fence which had been put up across the entrance to a dangerous place. Belish pleaded guilty and was fined $5 and costs.

ACCIDENTS.

From the list of accidents for the past year it will be seen that fifty-nine persons lost their lives underground and two above ground, making a total of sixty-one. Of the fatal accidents below ground four were caused by falls of coal; eight by falls of rock; eight by mine cars; three by falling down chutes; two by premature explosion of explosives; one by gas explosion; thirty-one by carbon monoxide poisoning; one by stone falling down from side of shaft during process of sinking; one by asphyxiation by fumes from blasting. The two fatal accidents which occurred above ground were caused by mine cars.

Of the four fatalities which occurred by falls of coal two occurred at the working faces and two were caused by pillars dropping out while the persons were walking over the top of them. These pillars were not left of a sufficient thickness and when the first squeeze of the seam took place they dropped out, thus causing the men who happened to be on them to fall and become buried.

Of the eight fatalities caused by falls of rock, two of them were caused while main gangways were being repaired and five were due to falls of cap rock, and one due to the sides of a prospect trench caving in.

Of the eight fatalities which were caused by mine cars underground, two persons were killed by being caught between the cars and the loading chutes; two by being caught between two moving cars; one by being caught between sides of roadway and cars; one by being caught between the top of the car and the roof while riding on car; one being caused by the brakeman falling in front of the compressed air locomotive, and one by a man jumping off a moving car and being crushed against a chute.

Of the three fatalities which were caused by persons falling down chutes, two were workmen who were working at face, and one was a fire boss who was travelling across the chute when the coal above him slipped away.

Both the fatalities which occurred through the premature explosion of explosives occurred in rock tunnels which were being driven across the measures.

The fatality which occurred by axphyxiation was owing to a workman going back into his place too soon after the shots were fired, and before it was examined by the fire boss.

The fatality which occurred owing to a gas explosion was caused by one of the miners in the lignite field going over a fence which had been erected across an abandoned place and igniting gas.

The fatality which occurred by a stone falling down a shaft took place in a small shaft which was being sunk near Milk River, and was entirely due to lack of timber.

The catastrophe which happened on December 9th in the mine operated by the West Canadian Collieries, Ltd., at Bellevue, was responsible for the deaths of thirty-one persons, who lost their lives by carbon monoxide poisoning. There has not yet been sufficient evidence produced to show whether or not this was an explosion of gas or whether it was caused by heat being generated by the compression of air due to a large cave which took place in the abandoned workings of this mine. After all the evidence possible has been gathered I will submit to you a further report on this catastrophe.

The two fatal accidents which occurred above ground were caused by mine cars, one being caused by the driver jumping on to the bumper while the trip was in motion, and the other being caused by the man being run over by a trip of empty cars while proceeding from the wash-house to the mine mouth.

In connection with the fatal accident which occurred whereby a brakeman on the compressed air locomotive

in the Bellevue mine was killed, I found it necessary to take proceedings against the West Canadian Collieries, Ltd., for two contraventions of The Coal Mines Act.: one for employing the deceased underground while he was under sixteen years of age, and the other for employing the same person above ground during 1908 while he was under thirteen years of age. The company pleaded guilty in both cases and was fined $20 and costs.

A number of fatal accidents which have occurred, more especially in connection with the transportation, have been entirely due to the lack of discipline, and if The Coal Mines Act and the special rules in force at these mines had been strictly observed it is possible that the number of these accidents would have been diminished. In order to remove, as far as possible, the dangers to be apprehended by persons being crushed between the moving cars and the chutes, the inspectors have been taking steps to remove this danger as far as possible by requiring such alterations to be made in the construction of chutes as local conditions will permit.

There have also been five serious accidents above ground and thirty-six below ground, and seven slight accidents above ground and fifty-one below ground, making a total of one hundred and sixty accidents.

TABULATED LIST OF ACCIDENTS ABOVE AND BELOW GROUND.

Cause	Fatal		Serious	
	Above	Below	Above	Below
Falls of coal	..	4	..	3
Mine cars	2	8	..	17
Shaft accidents	..	1	4	1
Gas explosions	..	1	..	..
Carbon monoxide poisoning	..	31	..	..
Machinery	..	..	..	..
Falls of rock	..	8	..	10
Explosions	..	2	..	4
Asphyxiation	..	1	..	..
Falling down chutes	..	3	..	..
Railway cars in mine yards	..	..	..	..
Other causes	..	..	1	1
Total	2	59	5	36

Before going to press I am pleased to report that there has been a considerable decrease in the number of fatal accidents during the first three months of this year as compared with the first three months of the year 1910.

MINING EXAMINATIONS, PROVINCE OF ALBERTA

Examinations held by the Albertan Department of Public Works

(Continued from February 1st Issue.)

Mine Manager's Examination.

Paper No. 6. Time allowed, three hours. The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

LEVELLING.

1. Describe how you would level a road having a gradient of 1 in 1½, also how you would level a road having a gradient of 1 in 150. State your reasons for any ascribe. ( )

2. Fill in the following level notes, showing height of instrument, elevation and grade, and state what is the average grade from Station 0 to Station 18. Stations are 100 feet apart.

Station.	B.S. Feet.	I.S. Feet.	F.S. Feet.	H.I.	Elev. Feet.	Grade.	Rem'ks.
O.B.M.	6.70	....	....	....	20.00	....	....
1	....	3.40	....	....	....	....	....
2	....	4.20	....	....	....	....	....
3	....	2.80	....	....	....	....	....
4	....	5.70	....	....	....	....	....
5	....	1.80	....	....	....	....	....
6 T.P.	....	....	2.90	....	....	....	....
..	8.30	....	....	....	....	....	....
7	....	7.40	....	....	....	....	....
8	....	6.50	....	....	....	....	....
9	....	2.80	....	....	....	....	....
10	....	8.40	....	....	....	....	....
11	....	3.50	....	....	....	....	....
12	....	2.40	....	....	....	....	....
13	....	4.70	....	....	....	....	....
14 T.P.	....	....	1.80	....	....	....	....
..	5.40	....	....	....	....	....	....
15	....	2.20	....	....	....	....	....
16	....	6.80	....	....	....	....	....
17	....	4.30	....	....	....	....	....
18	....	....	3.82	....	....	....	....

3. Plot the notes given in question 2, on a vertical scale of 10 feet to the inch and a horizontal scale of 100 feet to the inch, marking on the number and elevation of each station. (25)

4. Describe an Engineer's level, and explain how you would determine whether or not the instrument was properly adjusted. (10)

5. Two drill holes one mile apart are put down to a seam of coal; the depth of the first is 634 feet, and that of the second 850 feet. The surface of the former is 25 feet above the top of the latter. What is the inclination of the coal seam between the two points measured in inches per year? (15)

6. Describe a levelling rod, and state for what purpose it is used. (10)

Mine Manager's Examination.

Paper No. 7. Time allotted, three and one-half hours. The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

SURVEYING AND MAPPING.

1. What is meant by declination and variation when speaking of the compass? (10)

2. What are the ordinary sources of error to be

avoided when laying down new surveys on old plans? (12)

3. Calculate by sines and cosines the bearing and length of the closing lines of the following traverse: (10)

Station.	Azimuth.	Distance.
0 to 1	22.18 degrees.....	240 feet
1 to 2	68.15 degrees.....	305 feet
2 to 3	118.36 degrees.....	270 feet
3 to 4	172.45 degrees.....	380 feet
4 to 5	248.30 degrees.....	265 feet
5 to 6	285.14 degrees.....	160 feet

4. Plot the traverse given in question 3 on a scale of 100 feet to 1 inch, draw the closing line from station 0 to station 6 and calculate the area of the enclosed figure. (15)

5. Give a general description of a theodolite and explain in detail the method of making an underground survey with it. (10)

6. Explain what is understood by the terms "True North" and "Magnetic North" and how each is ascertained. (10)

7. Explain in detail what steps you would take for connecting an underground survey with a surface plan so as to secure their true relationship. (10)

8. If a roadway is driven a distance of 500 feet on a rising grade of 10 degrees, what should be the distance represented on the mine plan, and what height has the breast attained above the gangway level? (10)

9. Draw to scale, showing side and elevation what you consider the best way of forming an air crossing in stoop and room workings. (13)

Pit Boss Examination.

Paper No. 1. Time allowed, two hours.
The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

COAL MINES ACT.

1. What are the stipulations in The Coal Mines Act relating to the use and handling of explosives in mines? State fully. (12)

2. What are the qualifications and duties of a Pit Boss as laid down in The Coal Mines Act? (8)

3. What are the provisions of The Coal Mines Act with special reference to shafts and outlets? (7)

4. What are the provisions of The Coal Mines Act relating to ambulances or stretchers? (5)

5. What do the general rules say regarding signals and manholes on planes worked by machinery? (11)

6. State fully all the provisions of The Coal Mines Act as to the use and handling of safety lamps. A quantity of fire damp is found at the face of a working place; state what steps you would take to comply with the Act. (15)

7. State shortly the provisions of the Act with regard to the employment of females and boys. (10)

8. What are the provisions of the Act with regard to necessary ventilation? (10)

9. What are the provisions of The Coal Mines Act regarding abandoned mines? (7)

10. What are the provisions of The Coal Mines Act relating to the withdrawal of workmen in case of danger? (10)

11. What are the provisions of The Coal Mines Act relating to the inspection of machinery? (5)

Pit Boss Examination.

Paper No. 2. Time allowed, two and one-half hours.
The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

VENTILATION.

1. What gases are met with underground, and to what extent are they dangerous in the air of mines? (12)

2. What dangers are to be apprehended from the presence of coal dust in dry mines? And what systematic precautions are best suited to them? (8)

3. What circumstances would guide you in determining what quantity of air necessary for the ventilation of a mine? (7)

4. There is passing along an airway 35,000 cubic feet of air per minute. What will be the velocity per second if the size of the airway is 7.5 ft. by 5.5 ft. (5)

5. Describe the water guage and state where and why it is applied. (8)

6. What horse power would an engine exert when

5. Describe the water gauge and state where and why it is applied. (8)

7. A barometer registers 30 inches at the surface, what will it register at a point 1,890 feet below the surface? (8)

8. Explain the term "Motive column," and how is it expressed and how is it ascertained. (6)

9. A shaft is 500 yards deep and 16 feet in diameter. What is the extent of the rubbing surface? (5)

10. Describe the barometer. Of what use is it in connection with mine ventilation? ( )

11. Explain the principal and construction of a safety lamp of which you approve. What are the features that render one safety lamp more sensitive to gas than another? (11)

12. Ventilate the given plan showing direction of air currents and marking on all stoppings, doors, air crossings, etc. (14)

Pit Boss Examination.

Paper No. 3. Time allowed, three and one-half hours.
The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

PRACTICAL WORK.

1. Describe the process of timbering (a) Circular shaft; (b) Rectangular shaft, in soft ground. (11)

2. Explain with sketches, two methods of timbering a main haulage road in a seam 6 feet thick with soft roof, and pavement at a depth of 250 yards. Assume the size of the roadway, and give the dimensions of timber used. (12)

3. Assuming that a large number of accidents occur on underground haulage roads, what precautions and rules do you consider necessary to insure the safety of persons working and travelling on these roads? (8)

4. Explain the various kinds regular and irregular cleavages, joints and fractures which you have noticed in coal seams, and in the roofs of coal seams. Describe their influence on the mode of working, and the safety of the workmen. (9)

5. Explain in detail the precautionary measures you would adopt when driving towards old abandoned

workings, which may contain an accumulation of gas or water. (7)

6. In determining the size of a shaft pillar what effect will the depth of the shaft, and the inclination of the seam have? (5)

7. What explosive would you use for blasting in coal in a mine giving off C. H. 4? Give your reasons for preferring it, and describe the method of procedure you would adopt if you were acting as shot lighter, from the time the hole is drilled until the workmen return to work after the shot is fired. In the event of a shot missing fire, what action would you take? (11)

8. What are winding and haulage ropes made of, and what regulations for their preservation are required in the interests of safety and economy? (10)

9. What observation and data are required to determine the quantity of air pass in a mine, and the efficiency of the ventilating appliances? (7)

10. Is spontaneous combustion possible in a coal mine? If so, what are the probable causes producing it, and what means would you employ to prevent it? In the event of a mine fire what precautions would you take to protect the workmen employed in extinguishing the same? (10)

11. How would you proceed to remove a body of C. H. 4 from a series of breasts pitching 30 degrees, the gas having accumulated during a stoppage of fan? (7)

12. In case a squeeze occurs in a mine of which you had charge, endangering a heading and threatening to shut off part of the work, how would you proceed to stop its progress? (6)

Pit Boss Examination.

Paper No. 4. Time allowed, three and one-half hours. The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

MACHINERY.

1. What is the object of a safety valve on a steam boiler? What form of safety valve would you use? Describe it and give your reasons for preferring it. (10)

2. Explain what you mean by the term "unit of work," and the term "unit of heat"? How was the term horse-power arrived at and what does it represent? (8)

3. Show how you determine the horse-power of a pair of engines 24 inch cylinders and 4 feet stroke, running 50 revolutions a minute, and having an average effective steam pressure of 50 pounds per square inch. What do you understand by the term average effective pressure? (12)

4. What provisions would you make at a colliery for keeping up the ventilation in case of a break-down of the ventilating appliances? In the event of a serious stoppage of ventilation when the men were at work, what action would you take? (9)

5. Describe briefly how you would prevent the oscillation of the bucket in a shaft being sunk to a considerable depth. (10)

6. Describe in general terms the plant you would require for sinking operations. (9)

7. Is it necessary in colliery winding engines on the second motion to have a brake applied both to the crank shaft and also to the drum itself? Give reasons for your answer. (6)

8. If you were asked to advise generally as to the safety appliances in colliery winding, what generally would be the appliances you would recommend? (8)

9. What are the dangers to be apprehended in connection with the application of electricity to mining operations? What precautions would you take to guard against these dangers? (10)

10. What is the safe working load for a steel hoisting rope seven-eighths inch in diameter? (10)

11. What useful horse-power is expended in raising 435 gallons of water per minute to a height of 528 feet? (8)

Pit Boss Examination.

Paper No. 5. Time allowed, three and one-half hours. The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

SURVEYING AND LEVELLING.

1. Describe how you would make a survey of underground workings, where in many places the needle is liable to be affected by attraction. (12)

2. Plot the following compass survey to a scale of 100 feet to the inch:

Station	Bearing	Distance
1	S. 47 E.	240 feet
2	S. 79½ W.	130 feet
3	S. 30¾ W.	210 feet
4	N. 62½ W.	325 feet
5	N. 41 E.	230 feet (15)

3. Give the bearing and length of the closing line of the above survey. (10)

4. Describe how you would proceed to level with a spirit level, and a straight edge, and also with a regular levelling instrument, and under what conditions you would use the one in preference to the other. (14)

5. Show by diagram how you would have the sights of a compass placed in relation to the needle in laying out a roadway to be driven N. 75 W. (9)

6. What are the dangers and consequent results arising from not having accurate and complete surveys of the workings of a mine? (12)

7. An annemometer registers 30,000 feet velocity per hour in an airway 8 feet by 5 feet. What is the volume of the air passing per minute and how would you ascertain whether or not the annemometer is in good working order? (9)

8. Describe how you would proceed to put up sights for the guidance of workmen in driving their working places. (11)

9. What angle is included between N. 87½ E. and S. 15 W.? (8)

Fire Boss Examination.

Paper No. 1. Time allowed, three hours. The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

COAL MINES ACT.

1. State the requirements of The Coal Mines Act as to the duties and qualifications of: (a) Fire Boss, (b) Shot-lighter. Write an imaginary report you would make after examining a mine as Fire Boss. (12)

2. What are the provisions of The Coal Mines Act relating to the use of safety lamps? (16)

3. State the provisions of The Coal Mines Act regarding manholes. (14)

4. What are the provisions of The Coal Mines Act relating to the use and handling of explosives in mines? (16)

5. What are the provisions of The Coal Mines Act regarding the appointing of stations at a mine? (10)

6. What does The Coal Mines Act say regarding: (a) Inspection of Machinery; (b) Fencing of Machinery? (10)

7. What are the provisions of the General Rules regarding the division of a mine into districts? (10)

8. If you found a part of a mine dangerous from any cause whatever, when making your daily inspection while the men are at work, state fully what action you would take. (12)

Fire Boss Examination.

Paper No. 2. Time allowed, two and one-half hours.

The value attached to each question is given in parenthesis. Candidate must obtain 60 per cent. of the allotted marks to pass.

VENTILATION.

1. What noxious gases are met with in coal mines? Give their composition, and say under what conditions they are found. (14)

2. Describe in detail how you would test for gas with an ordinary safety lamp so as to incur the least risk to yourself during the test. How would you tell whether or not gas was present in dangerous quantities? (11)

3. Give a short description of the barometer and thermometer. Explain the action of each, and say what their use is in connection with the ventilation of mines. (11)

4. Ventilate the given plan, showing direction of air currents, and marking on all stoppings, doors, air-crossings, etc. (15)

5. Describe the construction of a safety lamp of which you approve. Give your reasons for approving of it and say what are the essential features of a good safety lamp. (9)

6. Is coal dust dangerous in a mine without the presence of C.H.4? If so, describe the conditions under which it becomes dangerous, and say what precautions you would take to overcome these dangers. (8)

7. Make a neat sketch of a stopping you would build in a cross-cut between the main intake and main return airways of a pitching seam giving off a quantity of C.H.4. Give dimensions and material used. (9)

8. What precautions would you adopt to prevent loss of life and property in mines subject to sudden outbursts of carburetted hydrogen?

9. Which do you consider should be the larger, the main intake or return airway, and why? (6)

10. What are the dangers due to shot-firing in gaseous mines and what precautions would you adopt to prevent these dangers? (7)

Fire Boss Examination.

Paper No. 3. Time allowed, two hours.

The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

PRACTICAL WORK.

1. Give a full account of your experience in coal mining. (12)

2. Describe two methods of firing shots. Say which you prefer and give reasons. Under what conditions would you prohibit shot firing? (11)

3. How would you determine whether a fault met with in the coal was a downthrow, upthrow or overlap? Describe how you would prove the fault. (11)

4. State in detail what precautionary measures you would adopt when approaching old abandoned workings. (12)

5. Give your opinions as to the comparative efficiency and safety of (a) black powder; (b) monobel powder; (c) dyanmite. Say under what conditions you would use each. (14)

6. Describe with sketch the driving and timbering of a main haulage road with soft roof and pavement. Show how the alignment and gradient are kept. (14)

7. Describe with sketch the principle and action of the syphon. (11)

8. Describe a longwall system of working for moderately thick seams. (15)

Fire Boss Examination.

Paper No. 4. Time allowed, one hour.

The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

ARITHMETIC.

1. What is the area of a roadway 10 ft. 4 inches wide at the top by 9 ft. 3 inches wide at the bottom by 8 feet high? (12)

2. Divide 8758923 by 1934 and multiply the result by the difference between 3867 and 233. Work your answer to three places of decimals. (12)

3. A rectangular shaft 16 ft. by 9 ft. is sunk to a depth of 150 yards. How many cubic feet of material have been excavated from it? (14)

4. The velocity of the air in an airway is 6 ft. per second. What is the total quantity passing per minute if the size of the airway is 8 ft. 6 in. by 5 ft. 3 in? (12)

5. There are 900 yards of roadway to be timbered every four feet with props 5 feet long on each side of the road. How many lineal feet of prop wood will be required, and what length of crown trees will be required for same road if each crown tree is 5 feet long? (14)

6. If 150 cubic feet of air per minute is required for each man and horse employed in a mine, what total quantity per minute will be required if 85 men and four horses are employed on each of two shifts? The horses remain in the mine and are not taken out at the expiration of the shift. (15)

7. A mine working eight hours per day produces a daily output of 950 short tons, how many mine cars per hour will be required to handle this output if each car carries 2,300 pounds? (10)

8. A pump working 10 hours per day pumps 250 gallons of water per minute from a mine. What is the total feeder of water in gallons per 24 hours? (11)

THE ELMORE VACUUM PROCESS.

The report of the Ore Concentration Company controlling the Elmore vacuum concentration process mentions that the 12 unit plant at Sulitelma, Norway, where pyritic tailings are being treated, has been extended to 18 units, and that the 10 unit plant at the British Broken Hill mine is doing good work. In Mexico a mine has increased its plant to 3 units, and two plants have started in Canada. Applications have been filed for new patents which will, it is hoped, extend the use of the process.

THE LATE MR. JOHN B. HOBSON

BY E. JACOBS, VICTORIA, B.C.

(Continued from February 1st Issue.)

Mr. Hobson had so large a share in the establishment of hydraulic mining as an industy in the province that it is due to him and his memory, acknowledgment shall be made of this fact. Unfortunately a connected account of his activities in establishing this industry is not just now obtainable, so it must suffice for the present that quotations be made from known published reports, so that in this way a fairly adequate idea of the extent and importance of his work in the Quesnel mining division may be conveyed. In his official report for 1893, the late Mr. John Bowron (who, by the way, was another man to whom the Cariboo district owes much, for by his many years of faithful and useful official work he also, though along different lines to those Mr. Hobson worked, greatly advanced the interests of the district), wrote:

"On the Horsefly River, the Horsefly Hydraulic Mining Company, Ltd., of which Mr. Henry Abbott, of Vancouver, is president, and Mr. J. B. Hobson, manager, has acquired, either by location or purchase, a large area of hydraulic mining ground, situated immediately above the Falls, having admirable dumpage, which is of the utmost importance in hydraulic mining. This company, which kept a force of men employed during last winter in running tunnels, is well pleased with the prospects obtained, and as soon as the ditches are completed, will bring in an immense quantity of steel piping, preparatory to commencing work on a scale of magnitude hitherto unknown in the district. This company, under the same management, having obtained by purchase the South Fork Co.'s concessions, and the well known Hop E. Tong claim, and intermediate ground near Quesnelle Forks, is now making improvements to open up what is generally believed will prove one of the most productive mines ever worked.

Mr. W. Stephenson, then Provincial Government Agent at Quesnelle Forks, the same year reported, in part: "The expenditure of the Horsefly Hydraulic Mining Company on Horsefly River, I think, will amount to about $100,000 before its mine will be in thorough working order, while it is estimated the purchase and cost of preparing the South Fork of Quesnelle property for working will be about $300.00. A few such enterprises as these, managed by thoroughly competent and practical men, will go a long way to bring Cariboo once more to the front as a mining district."

The Cariboo Hydraulic Mining Company, prominent in which were Messrs. H. Abbott, J. B. Browning, and other Canadian Pacific Railway Company men then resident in Vancouver, worked the South Fork property for some years until the larger organization, the Consolidated Cariboo Hydraulic Mining Company, Ltd., incorporated in 1898, took it over and greatly extended the scope of its operations.

In the "Annual Report of the Minister of Mines" for 1897, the then Provincial Mineralogist, Mr. William A. Carlyle, described the property of the Cariboo Hydraulic Mining Co., at Quesnelle Forks, among others in the Cariboo district. An excerpt from that report will serve to indicate in some manner the difficulties Mr. Hobson had to contend against in preparing the big hydraulic mine for producing gold. He wrote: "The opening up of this mine has already required a large amount of capital, more than was estimated when preliminary calculations were made, but the difficulty of transporting equipment and supplies was great and the freight charges heavy, as after leaving the main Cariboo road there was 60 miles of execrable road, and much of the freight was so delayed that it could not be brought in on the better winter road, but was detained until the spring, when it had to be taken in under heavy expense or else work at the mine had to be postponed for another year. As to drainage area or average amount of snow and rainfall, there were no data whatever, and to explore the country in search of water supplies, an almost impenetrable thicket had to be cut through. To-day, with roads and trails cut and rough places smoothed out, it seems a comparatively easy undertaking, and the past difficulties and annoyances cannot be fully appreciated. But, although in an unbroken country more than 200 miles from the railway, Mr. Hobson, assisted by Mr. L. F. Warner, has clearly shown himself to be a pastmaster in undertakings of this character, as all the work so far done has been imperative and what the conditions demanded, and all such work has been done in the best manner, with a view to permanence and the correct method of mining; and while much of the work has been costly it has yet been done in the cheapest way, for thorough work in the first place always proves the most economical in the long run. That there is here a great property that will, when fully opened out, pay largely, is unhesitatingly believed by all who have studied the mine, and it will be many years before the deposit within the confines of this property will have been exhausted."

In 1902, Mr. Wm. Fleet Robertson, who succeeded Mr. Carlyle as Provincial Mineralogist, paid an official visit to Cariboo. In his account of the Horsefly Hydraulic mine, included in his report, which was printed in the "Annual Report" for 1902, wrote: "This property is under the management of Mr. John B. Hobson, who is also manager of the Consolidated Cariboo Hydraulic Mining Company, at Bullion. Mr. Hobson, hearing of the writer's visit to the district, had, with that courtesy which he so invariably extends to all visitors in the vicinity, driven all the way from Bullion to Harper's, a distance of 35 to 45 miles, in order to conduct him to and show him over the company's properties at Horsefly. He had also sent two men from Bullion to Horsefly to clear up any of the drifts, etc., which required it, so that the mine could be inspected."

Further on in his report, Mr. Robertson says: "Unquestionably much of the interest taken in later years in the placer gold of the old or high channels of the Cariboo district has been due to the action of the syndicate which brought Mr. Hobson into the country, and which was prepared to invest such large amounts of money in the plant and equipment necessary to develop the latent wealth of the old deposits of gravel. Added to this the extended experience of Mr. Hobson, his personal enthusiasm in his work, and his profound belief in the great future of the immense gravel deposits of the vicinity, have done much to stimulate that in-

vestigation which the district so needed. Mr. Hobson has been doing pioneer work in the district and has had all the difficulties of the pioneer in any new enterprise to contend with."

The extent of the hydraulic mining operations carried on under Mr. Hobson's management was indicated in a report made by him to his directors in February, 1900. Only a brief excerpt may be reprinted here, as follows: "The property comprises 34 placer mining leases, aggregating 2,584 acres of land. These leases cover for a distance of about ten miles, the auriferous deposits of a system of ancient rivers. The deposits included in the company's property vary from 400 to 600 feet in depth from surface to bottom of channel. The quantity is estimated at 500,000,000 cubic yards of auriferous gravel that is available for future washing by hydraulic process. The company's water-supply system, as now completed, consists of 33 miles of well-constructed canals, having a capacity for delivering at the mine 5,000 miner's inches of water, under a head of 420 feet. The sources of supply are at Bootjack Lake and Polley Lake, about 19 miles distant, and Morehead Lake, 10 miles distant, from the company's mines at Bullion. These lakes have an aggregate capacity for storing 1,016,000,000 cubic feet of water. This storage supply is augmented by the waters of other streams tributary to the main canals between the storage reservoirs and the mines. The mine equipment consists of a portable hydraulic plant of four lines of 30-in. and 22-in. rivetted steel pipes, aggregating 6,000 feet; six No. 8 hydraulic giants, with deflecting nozzles, varying from six to ten inches in diameter; one steam power hoisting and pumping engine for sinking shafts for bank blasting; also a complete outfit of mechanics' and mining tools, and implements of all kinds, sufficient for 150 men. The mine lighting plant consists of six Wells' lights of 3,000 candle-power each. The telephone system includes three lines, aggregating 35 miles, with 15 instruments. The gold-saving appliances consist of a double-extended system of sluices, 7 feet wide by 4 feet deep, aggregating 2,380 feet in length.

During nine years, 1897-1905, nearly a million cubic yards of gravel was washed and gold to the aggregate of $1,042,708 recovered. Dry seasons experienced in several years made the water supply very inadequate, but as confirming Mr. Hobson's persistent contention that with an abundant supply of water, the recovery of gold would be large and the results profitable, it is on record that in 1900, when the time run was 172 days and the quantity of water used 460,278 miner's inches, gold to the value of $350,086 was recovered, at an aggregate cost of $151,182, against which may be placed the extremely disappointing results in 1903, when the time run was 53 days, the quantity of water used 127,083 miner's inches, and the gold recovered only $44,944, and that at an operating cost of $81,451.

Before the opening of the 1906 season, the Consolidated Cariboo Company's interests had all been disposed of to the Guggenheims, of New York, and it then seemed that the great ambition of Mr. Hobson's life during many years would be realized. This ambition had been the obtainment of an ample supply of water to enable him to demonstrate that his belief was justified, that with plenty of water operations would be profitable every year. His estimates called for an expenditure of $498,243 to complete the Spanish Lake water supply. He was assured the money would be provided, and the season of 1906 was spent But it was not to be. The "Annual Report" for 1907 has this reference by the Provincial Mineralogist to the undertaking:

"The most important mining property in Quesnel mining division has, for many years, been that of the Consolidated Cariboo Hydraulic Mining Co., at Bullion, in carrying out the necessary work as far as could be. on the south fork of Quesnel River. This property was taken over in 1906 by the Guggenheim Exploration Company, of New York, which company started in, after a careful examination of the property, to bring in a large additional quantity of water from Spanish Lake. The estimated cost of this additional water system was about $500,000, of which more than $200,000 was spent in 1906. The work was actively renewed in the spring of 1907 and carried on until July, when all work was suspended and since then the property has been idle. The new company has since announced its intention of abandoning the enterprise completely. The cause of this stoppage of work is not definitely known, but it is reported to have been, at least partially, that the then approaching financial panic in the East, which subsequently involved the New York company, necessitated a curtailment of outlay of capital."

Result of Abandonment of Mines.

There is little doubt the decision of the Guggenheims to abandon the great enterprise with which Mr. Hobson had for so many years been closely associated, and in the building of which he had spent some of the best years of his life, was a great shock to him. He became seriously ill, and for a time many of his friends feared he would not recover sufficiently to enable him to again actively engage in mining. However, he rallied sufficiently to enable him to resume work, and, under the impression that the leases of the whole of the property had been allowed to lapse, he once more engaged in hydraulicking on the old ground. His success was sufficient to cause the Guggenheim interests to pay up arrears of rentals on some of the leases, and then they obtained from the court an injunction which prevented Mr. Hobson from continuing his work there. Since then, "dog-in-the-manger" like, the holders of those leases have neither worked the ground themselves nor permitted Mr. Hobson to do so. But he was not to be beaten, for he set about bringing water on to ground on the north fork of Quesnel River, near the mouth of Spanish Creek, which ground was covered by his own leases and from which he could not be ousted, and throughout 1910 he, with dogged persistence and pluck, carried out his new plans. The season of 1911 saw him back again, after having wintered in California and returned in the spring in greatly improved health, but conditions did not permit of much gravel-washing being done. As the season closed, his health again failed, and on November 28, last, he left Casa Banca, on Quesnel Lake, for Victoria, where he was at once taken to the Jubilee Hospital. Two weeks later he was removed to "Gisburn," and slowly his condition improved until on Sunday, January 7, he was able to walk a little in the garden, while his cheerfulness increased the confidence of his family that he would soon get better. Early Monday morning, though, he became very ill, and by daylight on Tuesday morning he was dead. He left a widow, and three sons of 18, 13, and 5 years of age respectively.

His Belief May Yet be Vindicated.

It may be that in the near future the firm belief o the late Mr. Hobson in the practicability of deriving

large profits from hydraulic operations under such conditions, in regard to an abundant water supply, as he always laid down as indispensable, will be proved to have been well grounded, and his great ability be thereby vindicated, for another hydraulicking enterprise has been established, in connection with which it is claimed that an ample water supply has been provided. Mr. Howard W. DuBois, of Philadelphia, general manager and engineer for the Quesnelle Hydraulic Gold Mining Company, which last season completed its water supply system and commenced hydraulicking, remarked to me: "With only a moderate supply of water, Mr. John B. Hobson has demonstrated what can be done in hydraulicking the low-grade gravels of this district, so there is little room for doubt that with the abundant supply of water possessed by the Quesnelle Company, success is assured.

The magnitude of the prospective hydraulic gold-mining industry is indicated in the following excerpt from a report on the district, made by the Provincial Mineralogist, included in the "Annual Report" for 1902:

"The Consolidated Cariboo may be taken as an example of what to expect, namely, gold value of about ten cents per cubic yard. Mr. Hobson claims for his company that he has leases of 500,000,000 cubic yards of auriferous gravels, and it is safe to say that he has not, in these leases one-fifth of the available gravels, so that in this section alone there must be from 2,500,000,000 to 3,000,000,000 cubic yards of auriferous gravels. which there is every reason to think will be as rich as the Consolidated Cariboo Co.'s deposit. The immensity of these figures is hard to grasp, but to illustrate —if ten cubic yards yield $1 in gold, then there is in the Quesnel section alone $300,000,000 worth of gold. This vast amount of gold is so diluted with sand and gravel that the only possible means of extracting it is by the use of immense volumes of water under pressure; in other words, by hydraulic mining."

May it be my privilege, as in such case it would be my happiness, to, ere many years shall have passed, remind the public that in the recovery of large quantities of gold from the gravels of Quesnel district exists a lasting and abundant testimony to the skill, wisdom, and foresight of John B. Hobson, pioneer of hydraulic mining in the district, though he has been called to his rest without having first enjoyed the full fruition of his many years of arduous and efficient labour.

WAGES IN THE COAL MINES OF ALBERTA.

The scale of wages paid in the province during 1910 was practically the same as paid during the two previous years,

The general wage schedule for day labour is as follows:

Inside Men.

Fire bosses	$85.00 to $110.00	per month	
Shotlighters	3.00 to 3.50	per day	(8 hrs.)
Bratticemen	3.00	per day	(8 hrs.)
Bratticemen helpers	2.50	per day	(8 hrs.)
Timbermen	3.00	per day	(8 hrs.)
Timbermen helpers	2.75	per day	(8 hrs.)
Drivers	2.75	per day	(8 hrs.)
Drivers, wet places	3.00	per day	(8 hrs.)
Team drivers	3.00	per day	(8 hrs.)
Tracklayers	3.00	per day	(8 hrs.)
Tracklayers' helpers	2.75	per day	(8 hrs.)
Rock miners	3.50	per day	(8 hrs.)
Miners	3.00	per day	(8 hrs.)
Miners, wet places	3.50	per day	(8 hrs.)
Locomotive engineers	3.00	per day	(8 hrs.)
Switchmen	2.75	per day	(8 hrs.)
Chute loaders	2.75	per day	(8 hrs.)
Labourers	2.50	per day	(8 hrs.)
Timber handlers	2.75	per day	(8 hrs.)
Machine men	3.50	per day	(8 hrs.)
Machine men helpers	3.00	per day	(8 hrs.)
Switch boys	1.50	per day	(8 hrs.)
Door boys	1.50	per day	(8 hrs.)
Hoistmen	3.00	per day	(8 hrs.)
Rope riders	2.75	per day	(8 hrs.)
Couplers, boys	1.50	per day	(8 hrs.)
Couplers, men	2.50	per day	(8 hrs.)
Pushers	$2.75 to 3.00	per day	(8 hrs.)

Outside Men.

Pithead men	$2.50	per day	(10 hrs.)
Dumpers	2.50	per day	(10 hrs.)
Slate pickers, men	2.00	per day	(10 hrs.)
Slate pickers, boys	1.25	per day	(10 hrs.)
Car oilers, boys	1.25	per day	(10 hrs.)
Car oilers, men	2.00	per day	(10 hrs.)
Tally boys	1.25	per day	(10 hrs.)
Teamsters	2.50	per day	(10 hrs.)
Blacksmiths	3.50	per day	(10 hrs.)
Blacksmiths' helpers	2.50	per day	(10 hrs.)
Mine carpenters	3.50	per day	(10 hrs.)
Mine carpenters' helpers	2.50	per day	(10 hrs.)
Car repairers	3.00	per day	(10 hrs.)
Power house engineers.	3.50	per day	(10 hrs.)
Tipple engineers	3.25	per day	(10 hrs.)
Locomotive engineers	3.25	per day	(10 hrs.)
Loco. engineers' helpers.	2.80	per day	(10 hrs.)
Firemen	2.50	per day	(8 hrs.)
R.R. car handlers	2.40	per day	(10 hrs.)
Fanmen	2.50	per day	(12 hrs.)
Outside labourers	2.25	per day	(10 hrs.)
Fan firemen	3.00	per day	(12 hrs.)
Lampmen	2.50	per day	(8 hrs.)
Machinists	3.20	per day	(10 hrs.)
Machinists' helpers	2.50	per day	(10 hrs.)
Couplers	2.25	per day	(10 hrs.)
Sawyer	3.00	per day	(10 hrs.)

SPECIAL CORRESPONDENCE

NOVA SCOTIA

Dominion Coal Outputs.—The output of the Glace Bay mines for January will be about 281,000 tons, compared with 293,257 tons in January, 1911. The decrease in tonnage has been caused by the unusually severe weather conditions. High winds combined with low temperatures have hindered the banking of coal, and gales off the coast have delayed the freighting, making it necessary to lay the mines idle on a great many occasions.

The Springhill Mines did very well, having raised 38,700 tons in the month. This is the best month's work since before the strike in 1909. On two days the output has reached 1,690 tons from the two slopes. The mines are being gradually put into good order, as the steadily increasing outputs evidence.

The mining community of Cape Breton has suffered a great loss in the death of Dr. R. A. H. McKeen, who filled the arduous position of a colliery physician for a period which extended back to the very early days of coal-mining in the Glace Bay district. At that time facilities for communication between the collieries were but meagre, and the provision for injured men was of the rudest. The work of the colliery doctor is of a most exacting nature, and, although it calls for the exercise of great surgical skill and wide experience, it does not bring the same monetary reward or advancement that would come to a medical man of similar attainments in a wealthier community. Dr. McKeen was one of the finest types of a body of men whose worth is not properly appreciated, and the concourse of miners who attended his funeral showed to some small extent how great was the regard with which his life of self-sacrificing labours had invested Dr. McKeen in the minds of the community amongst whom he had worked for so many years.

New Colliery Officials.—Each time that the Dominion Coal Company adds a colliery to its steadily growing list several new officials are required, and as it has for a long time been the commendable practice of the company to make its promotions from amongst its own staff, it is natural that as each colliery reaches the producing stage there should be a great deal of curiosity as to those "in line" for the new positions. The latest collieries to require managers are Nos. 15 and 22, and the new appointments have caused a general promotion all along the line. The new officials are as follows:

Michael McIntosh, Manager No. 15 Colliery, transferred from the managership of No. 8 Colliery.

W. R. MacDonald, Manager No. 8 Colliery, promoted from Underground Manager of No 14 Colliery.

Robert Simpson, Manager Nos. 21 and 22 Collieries, transferred from the managership of No. 10 Colliery.

Joseph Bosh, Manager of No. 10 Colliery, promoted from the position of Underground Manager.

Malcolm Beaton, Manager of No. 16 Colliery.

The Dominion Coal Company now has fifteen colliery managers and four district superintendents at their Glace Bay collieries, in addition to the official staff of the Springhill Mines. Every one of these men, without exception, has worked his way from some subordinate position in the mine, and has gained the knowledge necessary to obtain his certificate of competence either in the provincial night schools, or through the medium of correspondence school tuition, generally by a combination of the two.

ONTARIO.

Cobalt and South Lorrain.—The first company controlled by English capital operating in Northern Ontario to pay a dividend paid a 5 per cent. dividend on February 12. This was the Cobalt Townsite Mining Company. The dividend calls for a disbursement of $50,000. The Cobalt Townsite, two years ago believed to be derelict, has been retrieved and last year produced a million ounces and had at the end of a year another million ounces definitely blocked out.

By shipping seven cars of high-grade mine ore and concentrates the Coniagas in the last week of January broke all its previous records. The average monthly shipment of the Coniagas to date for the year 1912 has been 152.02 against 105.69 last year. All the ore runs between 2,500 and 3,000 ounces.

The Casey Cobalt, another company controlled in England, has just shipped nine cars of low-grade ore from New Liskeard for treatment at the Northern Customs plant at Cobalt. The ore runs about 40 ounces to the ton. Last year total shipments amounted to 150 tons, but this was all of high-grade ore.

With the resignation of Mr. John Seward from the management of the Kerr Lake mine at the end of January the control of that property passed out of the hands of the Lewisohns, of New York, to that of the Mines Finance Company, of New York. The manager for the new interests, Mr. Robert Livermore, is already on the property, but Mr. Seward will remain till the end of the month. The Lewisohn interests are now definitely out of the Northern Ontario mining area, having some time ago sold out controlling interest in the Wettlaufer Lorrain mines to the Mines Finance Company.

The main shaft is now down at the Beaver to the 550-foot level, and a level is being established at the 530-foot level. From the lower levels of the Beaver a 30-ton car yielded about $50,000 recently. The ball and pebble mill of about 60 tons capacity at the Beaver should be running by about the end of February.

At the shaft 122 of the Nipissing on the hill another ore body has been cut at the intermediate level. The vein is from three to six inches wide and shows remarkably rich ore.

At the La Rose mine a shaft is now being sunk down to get below the big fault which cut off the vein and the ore just above the 200-foot level. It is believed that if the values are to be picked up at all they will be found in the conglomerate immediately above the Keewatin contact and the shaft is therefore being put down until the Keewatin is reached, when exploration will commence in the conglomerate immediately above. At the Lawson another nice body of very rich ore has been struck at the lower level of No. 9 vein and it is now being drifted upon. At the Princess another small vein has been picked up at the lower levels of the mine and the main stope is now full of broken ore.

The annual report of the Crown Reserve Mining Company showed that the net profits for the year would be $1,257,239. The directors reported a cash surplus of $764,851. The total production of the mine was valued at $6,581,847, and the total dividends paid at $3,714,509. The production of the mine during 1911 was valued at $1,833,516, with a net profit of $1,279,739. There was a surplus on the year's working of $104,865, leaving a total cash surplus of $764,851.

Porcupine, Swastika and Larder Lake.—The advent of the first comprehensive report by any of the larger Porcupine companies, namely the Hollinger statement, has given stability to the camp and forms a basis for sane conclusions. As far as

can be ascertained from the digest of the report that has appeared it would seem that of the $10,000,000 ore reserves, $4,000,000 is in ore actually blocked out and the residue in indicated ore. There has been some criticism among the mining men of the camp that the two items should not have been more definitely set apart. The values are much higher than was generally expected in the camp and it is felt that now the new power plant is running with power from the Mattagami River the underground work should make much more rapid progress. The structure of the mill is now almost completed and some of the machinery has arrived. Though set forth in the digest handed to the press by the Timmins syndicate it has not been officially announced yet that the merger of Hollinger, Dixon and Miller Middleton properties would go through. There is no doubt that as far as the mining situation goes the Hollinger report has cleared the air and companies in the vicinity of Pearl Lake will be able to go ahead with their development with much more confidence. The era of gold bars is not very far off now. The Dome mill will be in full operation by the middle of March and it is expected that the McIntyre and the Little Pet respectively of five and five stamps will be dropping by the first of next month. Generally in the Pearl Lake section the completion of the power plants of the various mines and the operation by current from Sandy Falls has induced more underground development work in one month than in any previous three years before. Half a dozen companies are now beyond the construction stage and can concentrate their efforts on underground development work.

The staff at the Dome has been further strengthened by the inclusion as superintendent of underground development of Mr. Chas. H. Henrotin, an engineer of South African experience. In blocking out ore at the fifty-foot level recently some very high-grade ore, as spectacular as is to be seen on the surface, was opened up. This ore body was encountered in driving from the main cross-cut.

Stations have been cut in both shafts at the Plenaurum mine at the 200-foot level and drifting and crosscutting will commence forthwith. The new electrically-driven compressor is now running smoothly and with seven or eight drills operating rapid progress with underground development work is now assured.

At the North Dome property, which the Temiskaming Mining Company has under option for $229,000, crosscutting has commenced from the 50-foot level of B shaft. As the vein only dipped from the shaft a few feet from the bottom of the present working it should soon be picked up.

The Bewick-Moreing Company, of London, has acquired a large block of McIntyre stock and is now considering a proposition which the Flynn syndicate has formulated for control. This provides that the company will take up 10,000 shares of stock at $6 for six months, and at the end of that period, 211,000 at $10 each if development is satisfactory. Meanwhile development continues to give satisfactory results. At the 200-foot level, 100 feet north of the No. 4 shaft, another ore body from three to four feet wide was struck carrying some visible gold and heavy in sulphides.

It is stated that operations will soon be resumed on the Porcupine Hecla, a property located on the base line between Ogden and Mountjoy Townships. So far beyond some surface trenching and the building of camps and the sinking of a few test pits nothing has been done.

In an official report President Ward, of the Vipond, states that since November 17th to January 15th cross-cuts at the 200-foot level had cut both No. 2 and No. 3 veins. The compressor is now running smoothly and the president expects that delivery of mill machinery will commence about the middle of this month. The blind vein which has been picked up on the Vipond at the 200-foot level, has every appearance of adding definitely to the ore reserves.

In crosscutting at the 100-foot level of the Dome Extension stringers of rich ore have been encountered, and like discoveries have been made in the shaft of No. 4. Captain Anchor is of the opinion that the workings are now entering the big ledge of the Dome. In diamond drilling near the Dome line an ore body about five feet wide was opened up with satisfactory values, it is reported.

On the Jupiter, No. 2 vein has been cut at the 200-foot level. The vein here has been split by the intrusion of twelve feet of schist. The aggregate width of the quartz in which the values occur is about eight feet. It does not show gold, but it assays well.

Mr. Ellis P. Earle, president of the Nipissing Mining Company, has, on his own account, signed an option to spend $50,000 on the Tommy Burns claims, in the southeast corner of Shaw. He will examine the properties early in the spring, when the snow goes off, and will then determine if they are worth the spending of development money as stated in the option. The claims are about nine miles from Porcupine and one mile from the Redstone River. Dr. Harvey Reed reported on them last summer and it is stated favourably.

The Swastika Mining Company has now cut its station at the 300-foot level and is crosscutting for the main vein which was struck with good values and width in the shaft at a depth of 290 feet. The Lucky Cross of Swastika has now opened up its main vein at two places 60 feet apart. In one spot it is from three to four feet wide and in the other only about eight inches. Values have not been declared.

Work has now definitely been commenced on the East Dome claims where the Preston East Dome Mining Company made a good strike last fall. A small plant is in operation and camps have been erected.

Development work is in full progress at the Langmuir Nighthawk Lake Gold Mines, with five claims in Langmuir. Camps have been built and a shaft is being sunk. Oscar Turner, the New York promoter, is interested in the scheme.

Development work on the Dome Lake property being satisfactory a six drill compressor has been ordered and work will be pursued with vigour. Two shafts have been sunk below the 100-foot level on a large sulphide dyke which, it is stated, gives good assay results.

Having exhausted the present water supply for its plant the Porcupine Apex has determined to shut down until the spring, when it will be readily available. It is stated that just before work was discontinued some visible gold was discovered in the shaft which was being sunk.

At the 90 and 60-foot levels of the Dobie mine in Whitney crosscuts are now being run to pick up the ore body so spectacular on the surface. Work on the Deloro claims of the same company continues to be most satisfactory.

BRITISH COLUMBIA.

A "Preliminary Review and Estimate of the Mineral Production of British Columbia in 1911," issued by the Provincial Bureau of Mines, gives the total value of the mineral of the province for last year as $23,211,816, which amount is less than that for 1910 by $3,165,250. The quantities and value of the various minerals are as follows: Placer gold, $468,000; lode gold, 225,083 ounces, $4,652,465 (total gold, $5,120,465); silver, 1,921,300 ounces, $972,946; lead, 27,975,000 pounds, $1,113,405;

copper, 39,500,000 pounds, $4,890,100; zinc, 2,600,000 pounds, $127,400; coal, 2,435,000 long tons, $8,522,500; coke, 77,500 tons, $465,000; building materials, etc., $2,000,000. The proportion of metalliferous minerals is $12,224,316, of coal and coke $8,987,500, and of miscellaneous $2,000,000. The decrease in value of production is attributable chiefly to the strike of the coal-mine employees in the Crow's Nest district, which involved non-production of coal and coke from Crow's Nest collieries in the province over a period of practically eight months, and, too, seriously interfered with the production of metals from Boundary district mines.

Quesnel.—It has been ascertained that the water system of the Quesnelle Hydraulic Gold Mining Company, the construction of which was sufficiently advanced to allow of a commencement to hydraulic gold-bearing gravel being made last August, has been found in operation to be most effective for the purpose for which it was designed and established. There was practically no interruption from the time operations were commenced until the cold weather of the approaching winter season necessitated the close-down customary in Cariboo district until the return of weather conditions suitable for hydraulicking.

Necessarily a large amount of preliminary washing had to be done in order to get the pits open, so that the work for some time could not be expected to result in the saving of nearly as much gold as when everything shall have been placed in such condition as will admit of practically all the work being productive. It has not yet been made public what quantity of gold was recovered last season, the information having to be first reported to the directors of the company, which has its headquarters in Philadelphia, Pennsylvania.

Minor defects were developed in the paving of the sluices, but as from the first it had been intended to eventually substitute steel plates for the diorite boulders put in with the idea that these could be made use of until the opening of the Grand Trunk Pacific Railway would lessen the present high cost of getting in heavy materials, the necessity for this change had been foreseen. However, it has been decided that it will be to the greater ultimate advantage of the company, owing to the excessive wear on the diorite lining of the sluice, to at once put in steel at the lower end of the sluice as a tail-race. The plates, which are now in course of transit to the mine, are made of high carbon steel from 0.80 to 1.20 per cent. carbon; they are half-inch plated, 58 inches square. The physical test to which they were subjected before being shipped from the manufactory showed that, although they are extremely hard, they have not the usual brittleness of such high carbon steel.

These steel plates will be placed in the tail-race two inches apart and will be so arranged that each will be half-an-inch lower than the one preceding it. This method of arrangement will have the effect of reducing to a minimum the wear on the upper part of each plate, and it is expected that the maintenance charge will be lower and that the use of these plates will admit of the property being worked with fewer men than under former conditions.

The head of the sluice will be provided with 40-pound manganese rails, placed transversely, which will act as a gold-saver. Manganese rails have been selected for the reason that they afford great resistance to abrasion, and the life of such rails in the sluice had already been determined to be many times that of the ordinary steel rail, which will last only a few months under conditions such as prevail in the sluice of this company at its mines in Quesnel mining division.

While, as already stated, the quantity of gold saved last season has not yet been made public, the fact that the company has gone to the heavy expense of putting in the steel equipment above mentioned would appear to indicate that the management has full confidence that results will be profitable from washing the two and a half million cubic yards of gravel it is estimated will be moved next season.

Slocan.—The Spokesman-Review, of Spokane, Washington, included the following information relative to the Rambler-Cariboo mine, in Slocan district, in the mining news printed in its issue of January 13th: "Mr. A. F. McLaine, president of the Rambler-Cariboo Mines, Limited, yesterday stated that he had just received a delayed report from Mr. W. E. Zwicky, of Kaslo, the company's manager. During the two or three weeks the report covered, the drift on the 1200-foot level had continued to show a good body of shipping ore, while the other workings in the mine revealed no material change in conditions. The orebody had not yet been reached on the 1400-foot level. The heavy snowfall of the previous week had completely blocked the sleigh road to Three Forks, over which the ore has to be hauled to the railway for shipment to the smeltery. All the men from the mine had been employed for two days in clearing the snow off the road, so as to admit of the shipment of ore being continued." To the Spokesman-Review's news may be added the information that in November 117 tons and in December 151 tons of Rambler-Cariboo ore was received at the Trail smeltery, making the total quantity from that mine received in 1911, 1801 tons.

Trail.—The figures showing quantity of ore treated at the smeltery at Trail of the Consolidated Mining and Smelting Company of Canada, Limited, during the calendar year 1911, together with the gross value of the metals recovered therefrom, are as follows: Tons of ore and concentrate treated, 330,668 (of which 324,431 tons was from British Columbia mines and 6,237 from the United States). Gross value of metals recovered: Gold, $2,754,189; silver, $773,906; lead, $834,644; copper, $522,774; total, $4,885,513. The proportion of gold was 56.4 per cent. of the whole value. The report for the month of December gave this information: "During December the Consolidated Company received 22,622 tons of ore and smelted 24,512 tons. The value of the month's production was $313,320, of which 38 per cent. was gold; the value of six months' production was $2,477,112, of which 58 per cent. was gold."

Gold at Hedley.—The Hedley Gazette, in a review, printed a short time ago, stated that the new policy inaugurated by the present owners of the Nickel Plate group of mines, situated in Hedley camp, Similkameen, of keeping development work ahead, is being rigidly pursued, and the year 1911 saw much more done than had been for years previously. Continuing, The Gazette mentioned that one of the important works done by the company last year, in addition to the development above referred to, was the excavation of 7,000 feet of ditch, for the purpose of adding to the water supply stored for use as required. The result of the year's development underground in discovering and blocking out new ore bodies, although not yet made public, is known to be very satisfactory. A comparatively large reserve of ore broken down is maintained in the mines. The Gazette closed its instructive and interesting review with complimentary mention of the management, thus: "Altogether the year has been one which must prove gratifying to the resident general manager, Mr. G. P. Jones, under whose careful supervision the results have been obtained, and to the president of the Hedley Gold Mining Company, Mr. I. L. Merrill, of Los Angeles and New York, who has given the mines and works his special attention."

About Princeton.—The prospecting of the Voight group of mineral claims, on Copper Mountain, near Princeton, by the British Columbia Copper Company, which is doing development work under a bond and option of purchase, gives much encouragement to those interested in metalliferous mining in this

part of the Similkameen district. The company mentioned is very desirous of obtaining new sources of ore supply for its large smelting works at Greenwood, Boundary district, so may be depended upon to give the Voight property a fair test within the bounds of expenditure fixed by its directors. Its success in finding here large bodies of ore of a sufficiently high copper content for profitable smelting would conduce to the considerable advantage of both the company and the district.

The construction and equipment of cement works at East Princeton is in progress, and it is hoped that the manufacture of cement will be commenced before the close of 1912.

GENERAL MINING NEWS

ONTARIO.

THE T. & N. O. FREIGHT RATES.

(From the Daily Cobalt Nugget.)

It is persistently rumoured that the T. & N. O. Commission will announce a decided reduction in the freight rates within a few days, and while nothing official has come out in regard to the matter the impression is very general that the requests of the people of this north country are to be met in a fair manner and a very much needed cut made in the freight rates.

In the event that this proves to be the case it will be a matter of decided congratulation on the part of this north country. The freight charges are a heavy item in the cost of doing business here. When the rates are exorbitant it makes it almost impossible for the Northern Ontario business men to meet outside competition. Relief has been asked for repeatedly from the T. & N. O. Commission and even if it has been slow in coming it will be none the less welcome when it does arrive.

The general impression has been that the government owned railway opening up this north country has been excessive in its freight charges. It is fair to admit though that privately owned roads through new sections of the country also charge excessive rates, and possibly Northern Ontario has not been any more burdened than in that section of New Ontario west from Sudbury for an equal distance towards the Soo.

The people along the T. & N. O. have always claimed this distinction though, that the volume of business should make some difference in the freight rates and that in view of the fact that this north country provides many times the business that the section west of Sudbury does that the T. & N. O. should recognize this fact and cut the rates in accordance. The T. & N. O. Commission cannot complain of the amount of business that this north country has given the railroad. It has been ten times as great as the expectations when the building of the railroad was commenced. The mining industry is responsible for the greater share of the business and it looks as though the mining industry will keep on increasing instead of showing any falling off for many years to come. That is, as the older camps get down to a milling proposition which reduces freight requirements, new camps will more than keep up the general average.

When the new rates are officially announced there will be general rejoicing among the shippers of this north country and it is to be hoped that the reduction will result in a far larger amount of business being done.

Cobalt, February 9.—One hundred and thirty-one bars of silver bullion, of a total value of $79,257, were sent out of the Cobalt camp during Monday, Tuesday and Wednesday of this week, which comes very near being a record three days' shipment. The rush is largely due to the fact that the Nipissing reduction plant has resumed operations, and that, owing to the high price of silver, all the mines which can ship are doing so. For the three days the total ounces shipped are as follows:—Nipissing, 70,190; O'Brien, 19,570; Crown Reserve, 18,000. The ore shipments last week were also particularly heavy, totalling 18 cars, of which 16 were high-grade ore.

Port Arthur.—The Silver Cross Mines, Limited, a company which has had no success in the Cobalt district, has secured control of a property near Port Arthur. This new property consists of 320 acres in the district of Thunder Bay. It is 2½ miles distant from the C.P.R. main line. The Canadian Northern will go through the property. The station, "Silver Harbour," will be built on the property. There have been several working mines in the district, but owing to difficulty of transportation and other obstacles, all the mines were closed down about 1890. The financial plan of campaign is unique. In order to secure funds to develop the property an issue of 8 per cent. $100,000 of ore certificates, and with each dollar invested in ore certificates, a bonus of one share, par value $1.00 of Silver Cross stock will be given free. The ore certificates are redeemable at their face value par.

BRITISH COLUMBIA.

INVESTIGATION OF PRICE OF COAL.

Nelson (From The Daily News, Nelson, B.C.).—In Nelson and the Kootenays, in common with many other districts in British Columbia, the price of coal is a burning question. To householders the cost of fuel is a considerable item in living expenses, and there is a general impression that the price charged to the consumer is altogether out of proportion to the cost of production.

The matter has been taken up on several occasions by the Nelson Board of Trade and there is a strong desire that the whole matter should be the subject of thorough investigation. The retailers disclaim any responsibility for the exorbitant price that is apparently being charged, and whether the high price is due to an excessive charge at the pit's mouth, to extravagant transportation rates, or to inordinate profits of dealers through whose hands the fuel passes can only be conjectured. There was hope that evidence taken before the conciliation board at the time of the recent strike would throw much needed light upon the subject, but that anticipation was disappointed and the need for investigation remains as urgent as before.

There is now assurance that an enquiry will be put into effect, and if it discloses an imposition upon the public some method will doubtless be found of giving relief. Last year, while the Laurier government held office at Ottawa a petition, strongly endorsed by the provincial government, was sent to the minister of trade and commerce petitioning the Dominion authorities to inaugurate a thorough investigation into the question of the price of coal, but the federal administration made no move and nothing was done. There has since been a change of government at Ottawa and the advisability of taking action will in due course be taken into consideration by the new cabinet.

There is no reason to believe that the Ottawa government will decline the investigation which is sought, but even should it do so an enquiry is now assured. Premier McBride's statement in the legislature is explicit. He believes that an investigation is a duty that should be undertaken by the Dominion

government, but he declares that should the Ottawa administration fail to act the provincial government will cause an inquiry to be instituted.

The fact that a proportion of the coal supply of British Columbia lies beyond the borders of the province makes it desirable that the investigation should be under federal auspices, and might tend to limit the scope of a provincial inquiry. But even so, an investigation under the direction of the McBride government is likely to have results that would be a boon to the consumers of coal in British Columbia. In spite of obstacles, Mr. McBride and his colleagues have a way of accomplishing objects that they believe to be for the advantage of the province.

Grand Forks.—The eighth furnace at the Granby reduction works at Grand Forks was blown in last week and it is believed the smelter is entering upon an era of record-breaking production. With the price of copper ranging around and about 14 cents, the Granby is in a position to make profits, and it is intended to operate at full capacity in order to get some copper on the market. It usually requires two or three months for the blister copper to reach the east and be refined ready for sale.

COMPANY NOTES

INTERNATIONAL COAL AND COKE.

The International Coal & Coke Co., which passed its quarterly dividend in November, also passed the quarterly dividend payable February 1st. Mr. A. C. Flumerfelt, the president, in a MINING—8-point—FIVE .... Pwllll circular, explains the reason as follows: "As you are perhaps aware, our mines were shut down during the last year for some eight months, owing to a general strike among the miners of Alberta and British Columbia. While there was no special controversy between this company and its miners—and their quitting work was in sympathy with the other miners in this district—it nevertheless caused a very heavy loss. The men returned to work last November, and our mines are now working full force. Because of this suspension of operations it was necessary to pass the last quarterly dividend, and it considers it good business judgment to pass the dividend which would regularly be payable on February 1st. With matters moving as they are now, it is hoped we can resume the payment of dividends in the near future."

DOME REPORT.

The first annual report of the Dome Mines Company, Limited, of Porcupine, shows that in the period ended November 30th last the company expended $1,097,745 and had $202,192 cash on hand November 30th, with but $13,545 in accounts receivable.

Of the $1,097,745 the company paid $672,060 on plant and equipment and $69,012 on general development. Bonds of $450,000 were redeemed in September. From gold produced the company received $4,276, and following the fire which destroyed the partly completed mill in July, the company collected in insurance $309,236. The mill is practically complete. The stamps will commence dropping next month.

When the property begins operations next month, it is expected to treat from 350 to 400 tons a day; the mill has 40 stamps with the necessary tube and other milling appliances to enable the operation of an 800-ton mill. The mill, rockhouse and power buildings are of steel and concrete and fireproof; the storehouse, laboratory and other buildings are of steel and brick. The company has completed a two-mile railroad spur connecting the mill with the Temiskaming & Northern Ontario Railroad.

No attempt is made in the report to give the tonnage in sight. It is stated that the diamond drill has indicated a large body of ore of good milling grade and that the ore has been cut at various depths to 1,000 feet and sufficient ore has been disclosed to justify permanent equipment of large capacity.

Eight shafts have been sunk from 35 to 200 feet and at the 50-foot level, 1,310 feet of drifting and crosscutting have been done; diamond drill holes have been put down for a total length of 9,046 feet.

The report adds that the insurance collected has been deducted from the amount shown as expended on the property and that in addition to the expeditures shown, the Monell syndicate expended $375,000, which makes a total of $1,169,588 spent in development and equipment.

The Dome directors and officers are Ambrose Monel, president; W. S. Edwards, E. F. Wood and W. A. Bostwick, vice-presidents; Alex. Fasken, secretary; E. C. Converse, Captain J. R. Delamar, C. I. Denison and J. S. Wilson.

STATISTICS AND RETURNS

CONSOLIDATED MINING & SMELTING.

The Consolidated Company's smelter at Trail received, during December, 22,622 tons of ore, and smelted 24,512 tons. The value of the month's production was $313,320, of which 38 per cent. was gold, and the value of six months' production was $2,477,112, of which 58 per cent. was gold.

BRITISH COLUMBIA COPPER.

The production of the British Columbia Copper Company for the fiscal year ended November 30th, was 9,969,026 pounds of copper, 130,441 ounces of silver and 30,742 ounces of gold, comparing with 7,143,456 pounds of copper, 84,180 ounces of silver and 24,962 ounces of gold in the previous year.

COBALT ORE SHIPMENTS.

The shipments for the week and year to date in tons are:—

	Week of Feb. 2.	Total.
La Rose	133.07	259.19
Coniagas	102.02	221.92
O'Brien	.....	61.15
Right of Way	.....	35.88
Chambers-Ferland	.....	32.00
McKinley-Darragh	73.28	208.41
Nipissing	35.25	118.65
Hudson Bay	31.42	62.95
Buffalo	28.12	57.31
Crown Reserve	22.45	68.25

Cobalt Townsite	65.29	88.79
City of Cobalt	66.33	66.33
Trethewey	42.28	42.28
Colonial	20.00	20.00
Kerr Lake	30.46	30.46
Cobalt Lake	37.54	37.54
Totals	667.51	1,411.11

The bullion shipments for the year to date are:—

Nipissing	$101,039.83	$181,019.00
Crown Reserve	42,080.40	78,728.08
Temiskaming	13,459.96	24,924.00
O'Brien	9,166.32	17,292.00
Nova Scotia	21,500	31,710.00
Buffalo	4,900.00	9,000.00
McKinley-Darragh	1,390.37	2,528.00
Miscellaneous	3,802.00	6,670.94
Totals	$198,421.88	$357,689.64

Eight mines shipped ten cars of ore during the week ended January 27th. Out of the total eight of these cars were high-grade, the total weight of ore shipped being 662,601 pounds. The increase in the shipments of ore this week has been offset by the decrease in the bullion shipments. The only shipment of bullion to go out during the week was a consignment forwarded by Campbell & Deyell to Mocatta & Goldsmid, of London, England, which consisted of eight bars, valued at $2,802. The increase in the ore shipments to be noted this week will undoubtedly be continued next week, when several other mines which are regular shippers come back into the list.

The shipments for the week and year to date, in tons, are:—

	Week Jan. 26.	Total.
La Rose	65.29	146.12
Coniagas	....	119.90
O'Brien	....	61.15
Right of Way	....	35.88
Chambers-Ferland	....	32.00
McKinley-Darragh	31.80	135.23
Nipissing	35.25	118.65
Hudson Bay	31.42	62.95
Buffalo	29.46	90.19
Crown Reserve	29.95	45.80
Cobalt Townsite	65.29	88.79
Total	281.66	936.66

The bullion shipments for the year to date are:—

Nipissing	$74,990 23	136,401.9
Crown Reserve	35,840 40	68,061.8
Temiskaming	13,459 96	24,924.0
O'Brien	9,166 32	17,292.9
Nova Scotia	9,500 00	11,710.0
Buffalo	4,900 00	9,000.0
McKinley-Darragh	1,390 37	2,528.0
Miscellaneous	3,802 00	6,670.94
Totals	$151,049 28	277,089.54

COBALT ORE SHIPMENTS FOR JANUARY.

Cobalt shipments for the month of January in tons were:—

La Rose	217.60
McKinley-Darragh	170.77
Coniagas	170.01
Nipissing	118.63
Cobalt Townsite	96.85
Buffalo	90.20
Crown Reserve	68.26
Hudson Bay	62.95
O'Brien	61.15
Temiskaming	41.87
Right of Way	35.88
City of Cobalt	33.33
Chambers-Ferland	32.00
Colonial	20.00
Trethewey	17.62
Total	1,237.12

COBALT DIVIDENDS

The total dividends paid in 1911 by Cobalt companies were $8,770,236, an increase of $2,000,000 over 1910, when $6,560,694 was declared.

The mines to decrease their declarations from 1910 were Kerr Lake, Nipissing, Right of Way, Temiskaming, and Hudson Bay.

Total dividends for the camp since its inception are placed at close on to $30,000,000.

Dividends declared for the year to date are:

	1911	Total to date.
Beaver	$170,000	$170,000
Buffalo	660,000	1,568,000
Cobalt Central	.....	190,460
City of Cobalt	.....	139,377
Coniagas	1,440,000	2,840,000
Crown Reserve	1,238,162	3,891,383
Foster	.....	45,700
Kerr Lake	990,000	3,720,000
La Rose	600,000	3,632,563
McKinley.	1,123,666	1,932,677
Nipissing	1,800,000	7,290,000
Right of Way	33,710	526,904
Silver Queen.	.....	315,000
Temiskaming	225,000	1,099,156
Trethewey	200,000	701,999
Hudson Bay	139,698	1,472,325
Wettlaufer	150,000	150,000
	$8,770,236	29,655,544

Dividends on Drummond and O'Brien, which are private corporations, are not included.

BRITISH COLUMBIA ORE SHIPMENTS.

The shipment last week of 52 tons by the Number One mine at Ainsworth, which has been bonded by the Consoldiated Company, marks the entry of another lead producer on the regular shipping list. This property is located at Ainsworth and has been under steady development by the Trail smelter company for some months. It was bonded from H. Giegerich and associates of Kaslo, B.C.

The shipments for the week ending January 27th smashed all records for the past twelve months, totalling 42,715 tons. The smelter receipts were 40,500 tons. The figures are:—

Rossland Shipments.

Centre Star	3,031	10,440
Le Roi No. 2	478	1,678
Le Roi No. 2, milled	300	1,200
Le Roi	1,250	2,904
Other mines	.....	33
Total	5,059	16,255

Boundary Shipments.

Granby	24,176	83,579
Mother Lode	8,832	29,227
Emma	656	2,478
Unnamed	172	934
Jack Pot	374	1,382
Other mines	.....	2,937
Total	34,210	120,537

Slocan-Kootenay Shipments.

Sullivan	479	1,175
Emerald	109	327
Arlington (Erie)	91	265
Standard	172	463
Van Roi	31	329
Utica	21	132
Ferguson	30	59
Rambler-Cariboo	60	125
St. Eugene, milled	420	1,680
Queen, milled	420	1,680
Granite-Poorman, milled	250	1,000
Van Roi, milled	800	3,200
Standard, milled	300	1,200
Richmond-Eureka	29	125
Ruth	36	73
Noble Five	94	124
Number One	52	52
Slocan Star	4	24
Ottawa	28	28
Other mines	..	176
Total	3,446	12,237

British Columbia Copper Company's Receipts.
(Greenwood, B.C.)

Mother Lode	8,832	29,227
Emma	656	2,478
Unnamed	172	934
Jack Pot	374	1,382
Other mines	...	2,937
Total	10,034	36,858

Granby Smelter Receipts.
(Grand Forks, B.C.)

Granby	24,176	83,579

Consolidated Company's Receipts.
(Trail, B.C.)

Sullivan	479	1,175
Emerald	109	327
Arlington	91	265
Standard	172	463
Van Roi	31	329
Utica	21	132
Ferguson	30	59
Rambler-Cariboo	60	125
Richmond-Eureka	29	125
Ruth	36	73
Noble Five	94	124
St. Eugene	101	302
Knob Hill	111	345
Queen	35	70
Centre Star	3,031	10,440
Le Roi No. 2	478	1,678
Le Roi	1,250	2,904
Number One	52	52
Slocan Star	4	24
Ottawa	28	28
Granite-Poorman	28	28
Other mines	....	285
Total	6,290	19,353

TORONTO MARKETS.

Feb. 12.—(Quotations from Canada Metal Co., Toronto.)
Spelter, 6.50 cents per lb.
Lead, 4.25 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.50 cents per lb.
Electrolytic, 14.50 cents per lb.
Ingot brass, 7 to 12 cents per lb.

Feb. 12.—Pig Iron (Quotations from Drummond, McCall & Co., Toronto.).
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

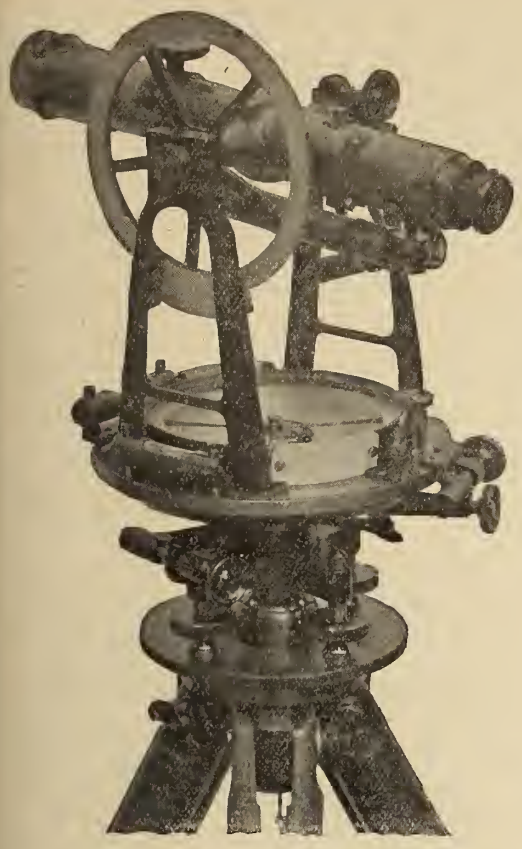
Coke.

Feb. 9.—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $1.80 to $1.90 per ton.
Foundry coke, prompt, $2.20 to $2.35 per ton.

Feb. 9.—Tin, straits, 44.25 cents.
Copper, Prime Lake, 14.37½ cents.
Electrolytic copper, 14.25 cents.
Copper wire, 15.25 cents.
Lead, 4.05 cents.
Spelter, 6.62½ cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 7.25 cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $44.50 per 75-lb. flask.

SILVER PRICES.

	New York. cents.	London pence
Jan. 25	57¾	26⅝
" 26	57¾	26⅝
" 27	57¾	26⅝
" 29	58⅛	26¾
" 30	58¼	26¾
" 31	58¼	26¾
Feb. 1	58½	26⅞
" 2	58¼	26¾
" 3	58½	26⅞
" 5	58⅝	26¾
" 6	58¾	27
" 7	58⅞	27⅛
" 8	59⅞	27½
" 9	60⅛	27¾



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Achromatic Terrestrial Telescope, 9 inches; objective glass, 1⅛ inches aperture, with dust cap, sunshade and dust protector to object slide. Improved achromatic eye piece with spiral motion for focusing cross hairs. Stadia Wires. Graduated Level Vial to Telescope. Clamp and Tangent screw to Telescope with counter spring. Vertical circle 4½" graduated to half degrees and numbered in quadrants, Veruier reading to one minute. Compass Needle, 3⅛" long. The compass is provided with variation plate, set by Capstan head pinion. Horizontal limb, 5⅛" graduated to half degrees and reading to one minute by two opposite Verniers placed at an angle of 30° to line of sight. The graduation has two rows of figures reading in opposite directions from Zero to 360°. Two Spirit Levels to horizontal limb, graduated on the glass, Clamp and Tangent screw with opposing spring. Long independent centre, four leveling screws, ⅝" shifting centre. Weight of instrument without Tripod 9½ lbs.

Instrument complete in Mahogany finished box, with plumb bob reading glass, adjusting pins, etc. Extension tripod, **$157.50.**

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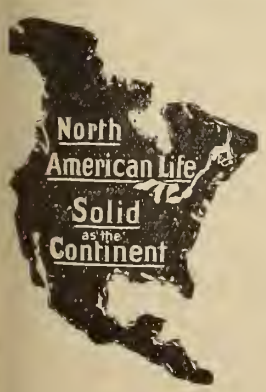

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to his family or those dependent upon him is measured by his earning capacity. As death entails the loss of that earning capacity, every man should make provision for his loved ones in order to make good to them the financial loss that would ensue. This is the purpose of life insurance, and no man is blameless whose life is not insured.

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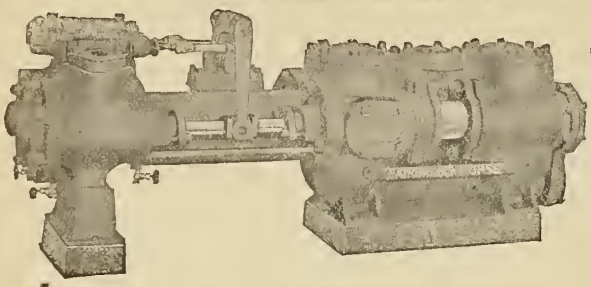

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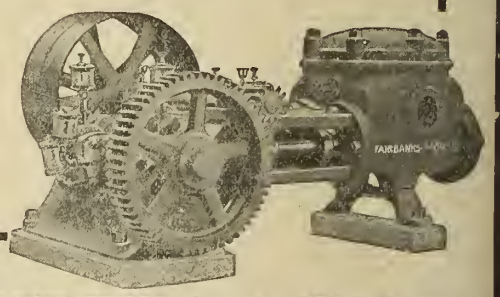

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The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

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Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, fivo per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

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Minister of Lands, Forests and Mines,

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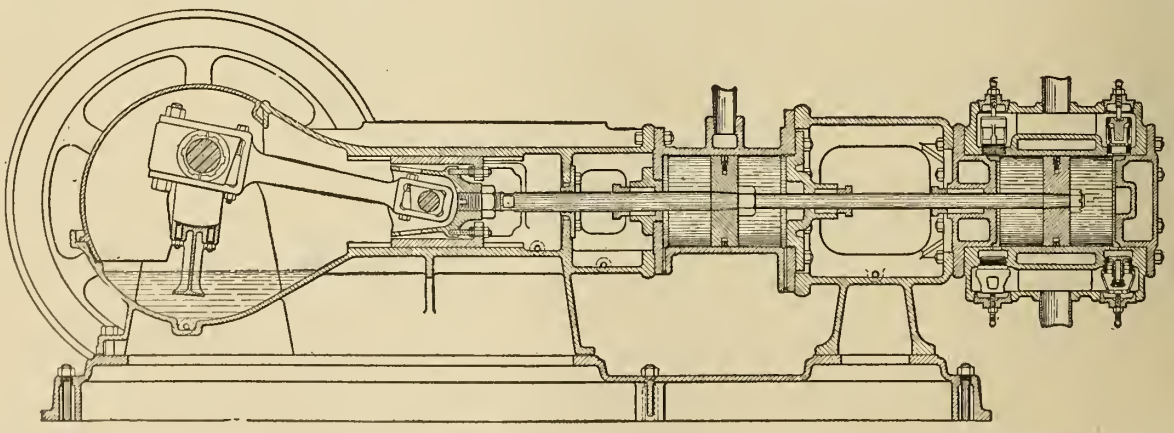

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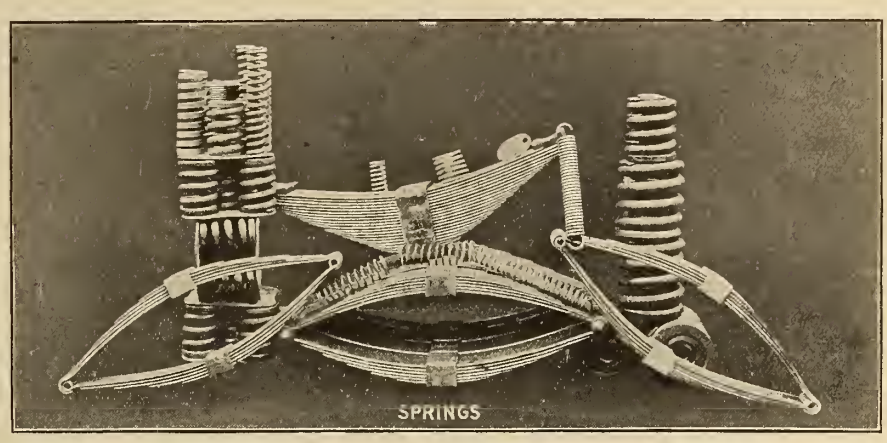

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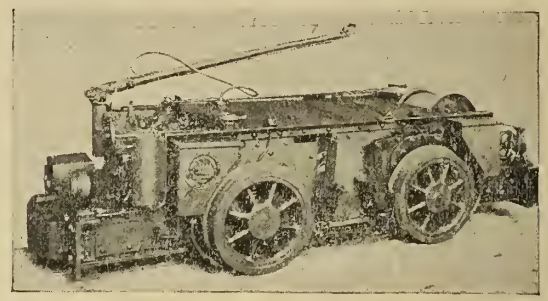

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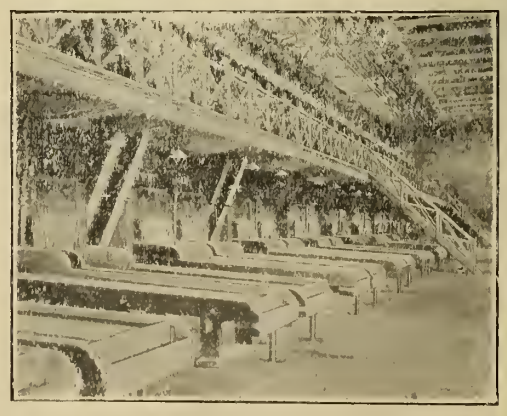

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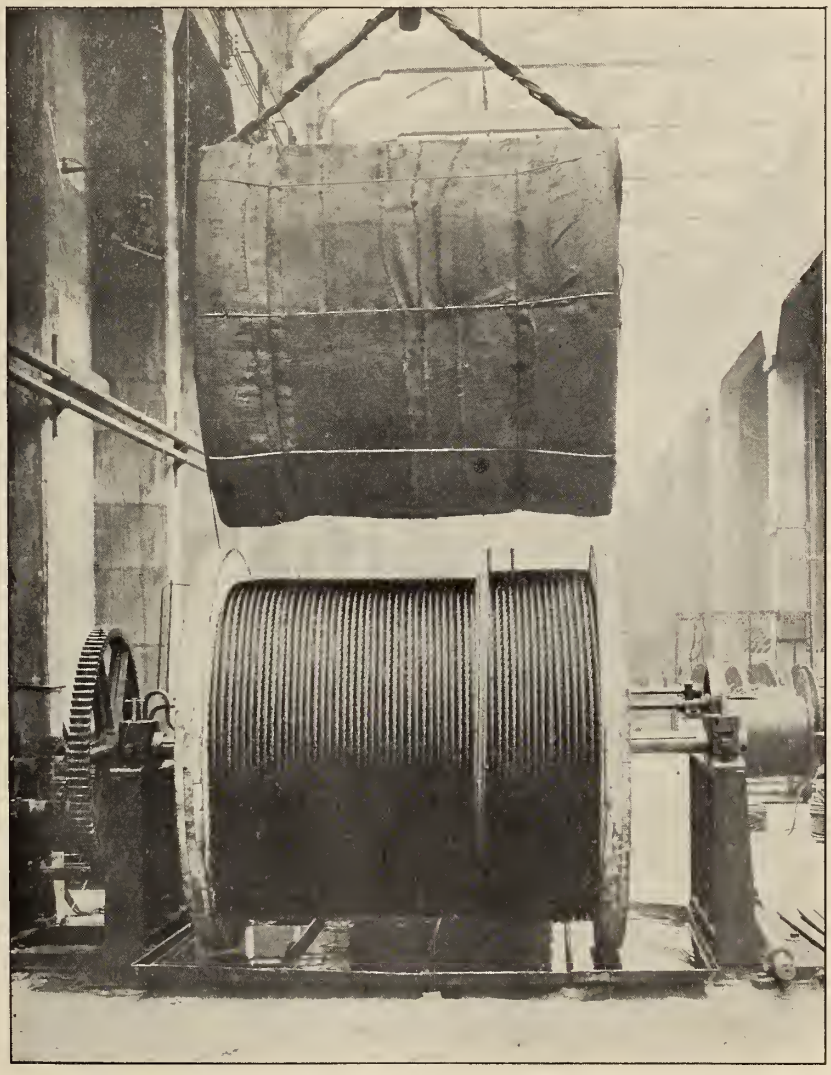

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MODERN AND UP-TO-DATE APPLIANCES
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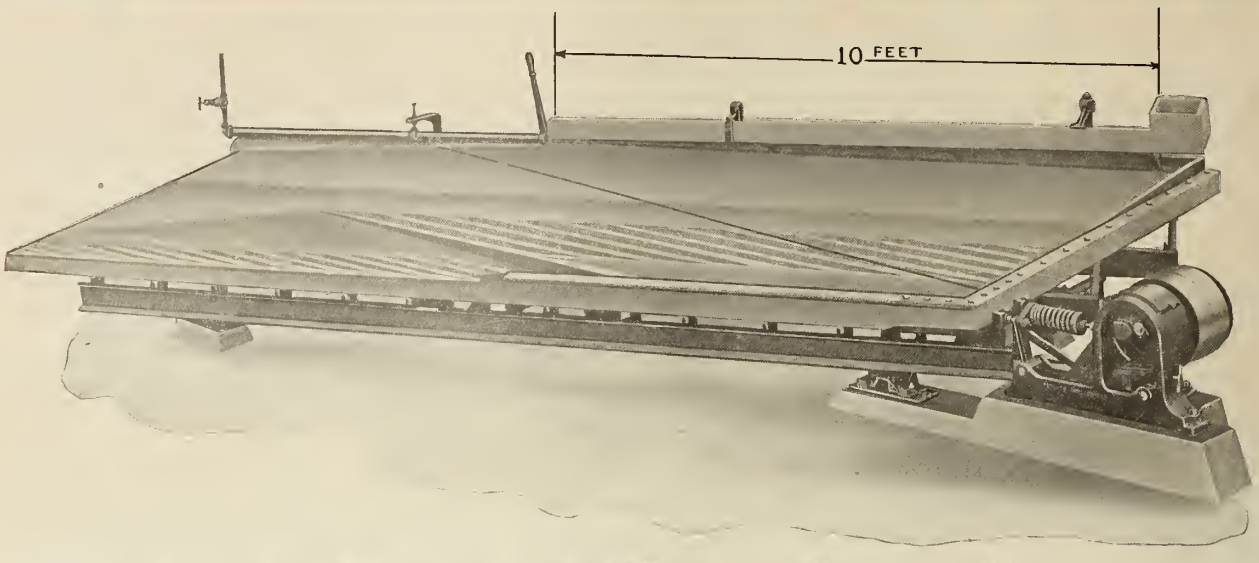

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The James Diagonal Plane Slimer Has Proven Its Superiority Over Its Competitors In The Cobalt District. This table is manufactured in New Glasgow, Nova Scotia, for the Canadian Market, and Newark, N.J. for the United States and Mexican Markets.

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"White Jacket"
— Safety —
FUSE
Reliable All Through

Spencer's
Crescent Steel
In All Sizes and Shapes

SPECIAL MINING STEEL

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NOISELESS IN OPERATION
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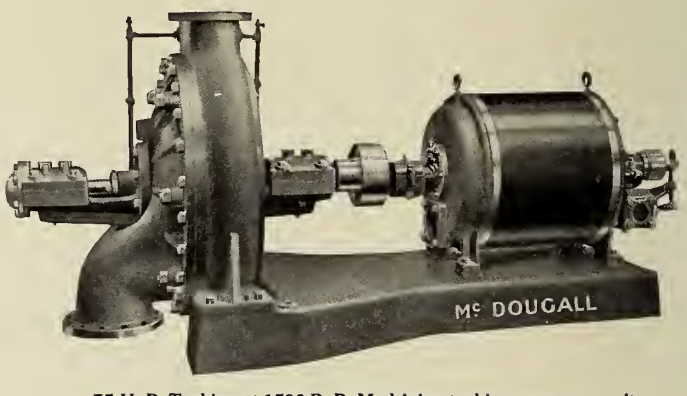
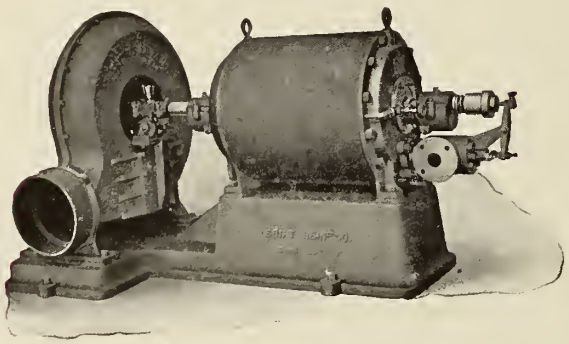
As a means of propulsion for centrifugal pumps no machine has yet been devised which fills the bill as satisfactorily as the small steam turbine. Because of its superior range of speed it is possible to get a unit of much smaller diameter than would be necessary in a larger pump driven by a reciprocating engine. To those unfamiliar with the modern turbine and the centrifugal pump the power and speed of these machines is almost incredible.



75 H. P. Turbine at 1500 R. P. M. driving turbine pump, capacity 1000 Imp. Gals. per Min. 150 ft. head.



Kerr-Turbo Cupola Blower Unit, Throttle or Governor Control.

Cupola Blowers with Turbines direct connected avoid the use of belts and countershafts. The speed at which the blower must run is the most advantageous speed for the Turbine; the combination is, therefore, an ideal one. Reliability and certainty of operation in the case of a cupola blower is of the utmost importance.

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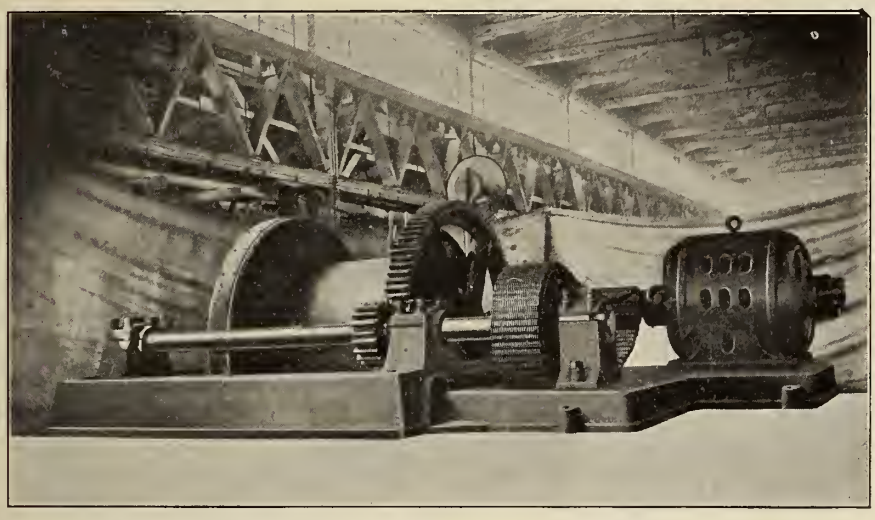

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INSURE AGAINST BREAKDOWNS.

transmit any power at a high speed quietly.

No Slipping, saves power continuously.

Runs either forward or backward, fast or slow, and is not affected by either heat, cold or moisture.

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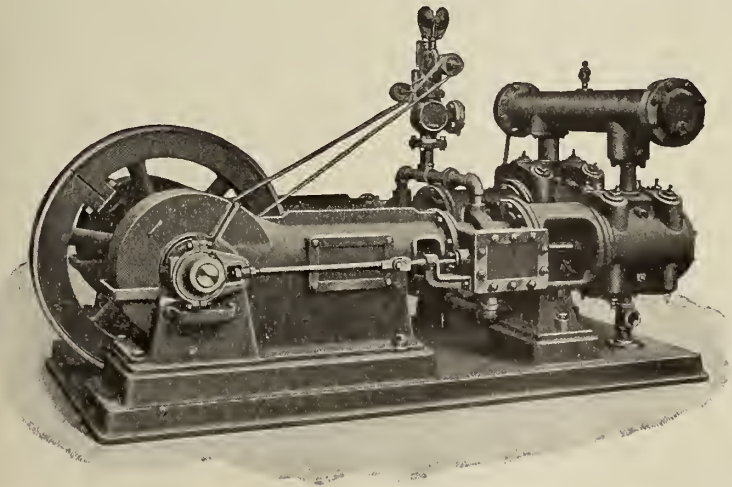

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MAY BE THE CAUSE OF YOUR FAILURE
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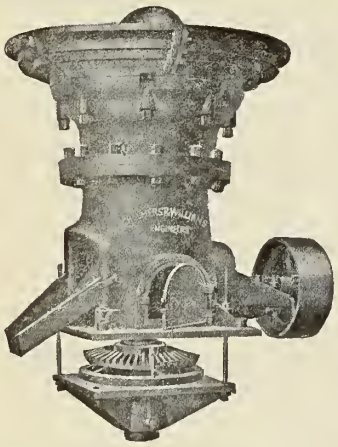
INSTALL OUR

Bronze Ball Gyratory Crusher

and insure getting the very best results as to large capacity, low cost of operation and maintenance.
WE GUARANTEE WORKMANSHIP and MATERIAL



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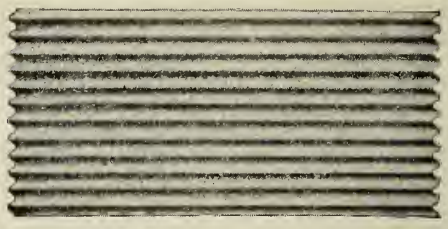
Straight or Curved

Stock carried of all gauges, lengths up to 10 feet.



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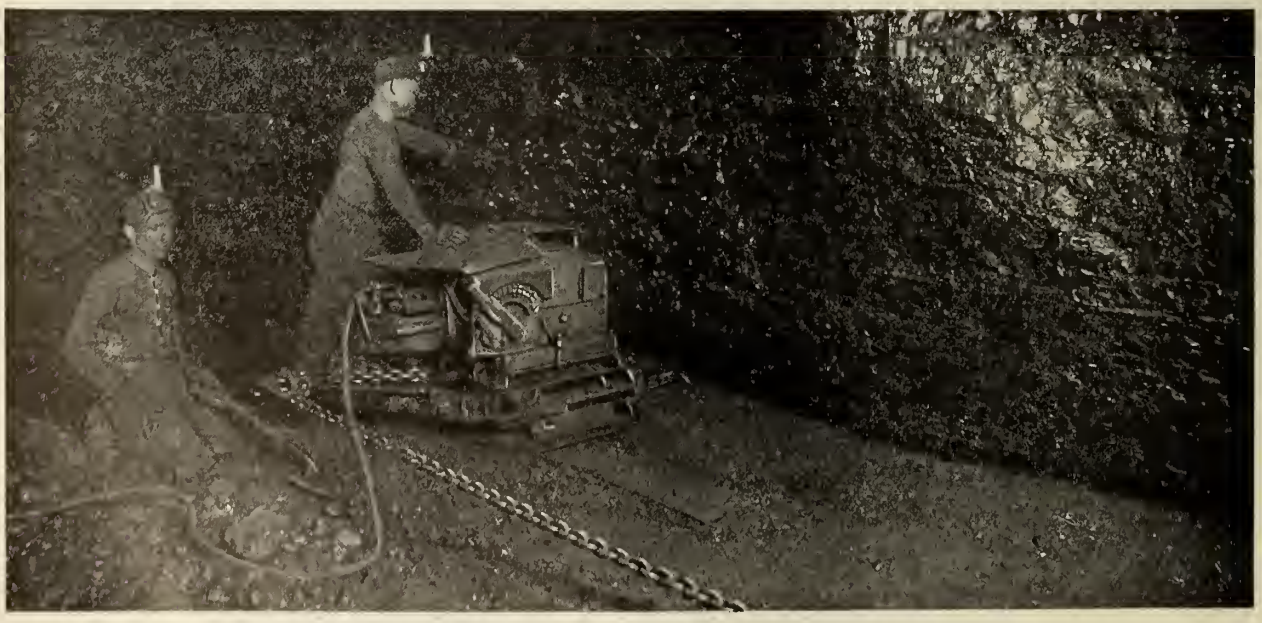
Most Efficient Mining Machines
Reasons? New Bulletin No. 663 F.



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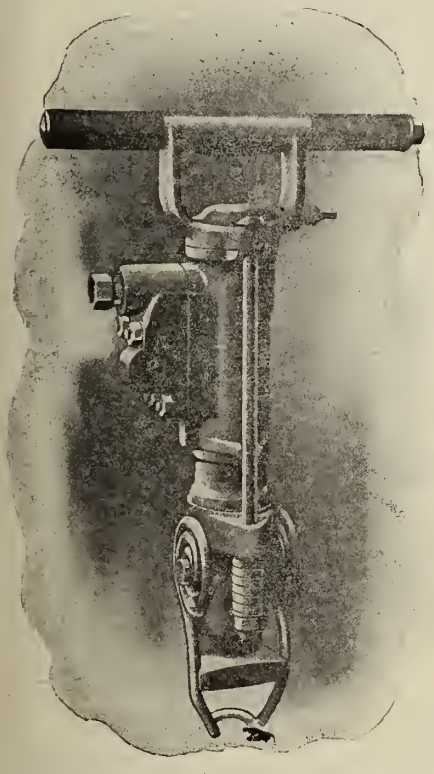
"B A 23" Hammer Drill—for use with steam or air. Weight 43 pounds

THE introduction of the "Butterfly Valve" has revolutionized hammer drill construction. These tools are light rock drills without mountings. They are being used to-day for all kinds of rock drill work, from block holing to shaft sinking. Coincident with the introduction of the "Butterfly Valve" we have made other improvements in Rand tools. These improvements have simplified design, increased drilling capacity, and reduced maintenance costs.



"B C R-43" Hammer Drill, with Automatic Rotation of Steel, for use with steam or air.

The adoption of the "Butterfly Valve" has proved the most successful event in the history of the hammer drill. Rand tools embody the best principles of the earlier rock drills combined with the advantages of the hammer type. The illustrations show these new tools to have separate front heads, buffer springs on the side bolts and other rock drill principles. Every part is as simple and plain as it is possible to make it. Using materials suitable for each part and simplifying design has reduced the cost of up-keep to practically nothing.

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Experience gained from forty-one years drill building governs the design of "Rand" drills.

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Let us work our drill problems together.

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Commercial Union Bldg. **MONTREAL, CAN.**

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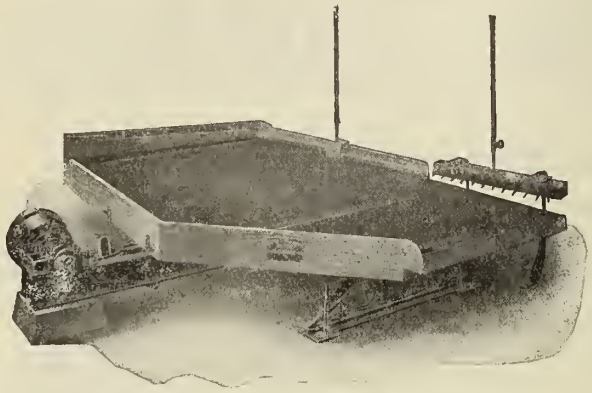
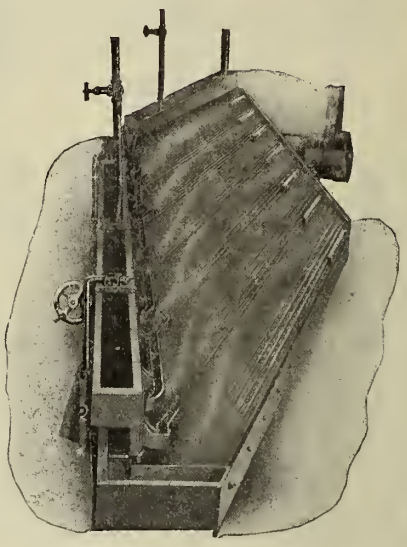


Improved No. 3 Deister Slime Table.



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Deister Improved No. 3 Slime Table for classified and unclassified feeds of 80 mesh and finer only.

Deister No. 4 Sand Table, better adapted to feeds from 8 to 80 mesh, classified or unclassified, than any device on the market.

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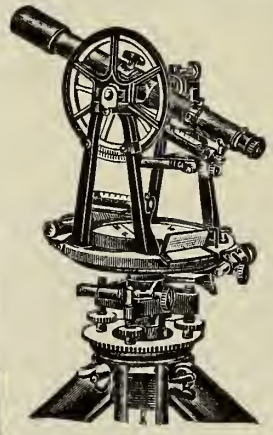

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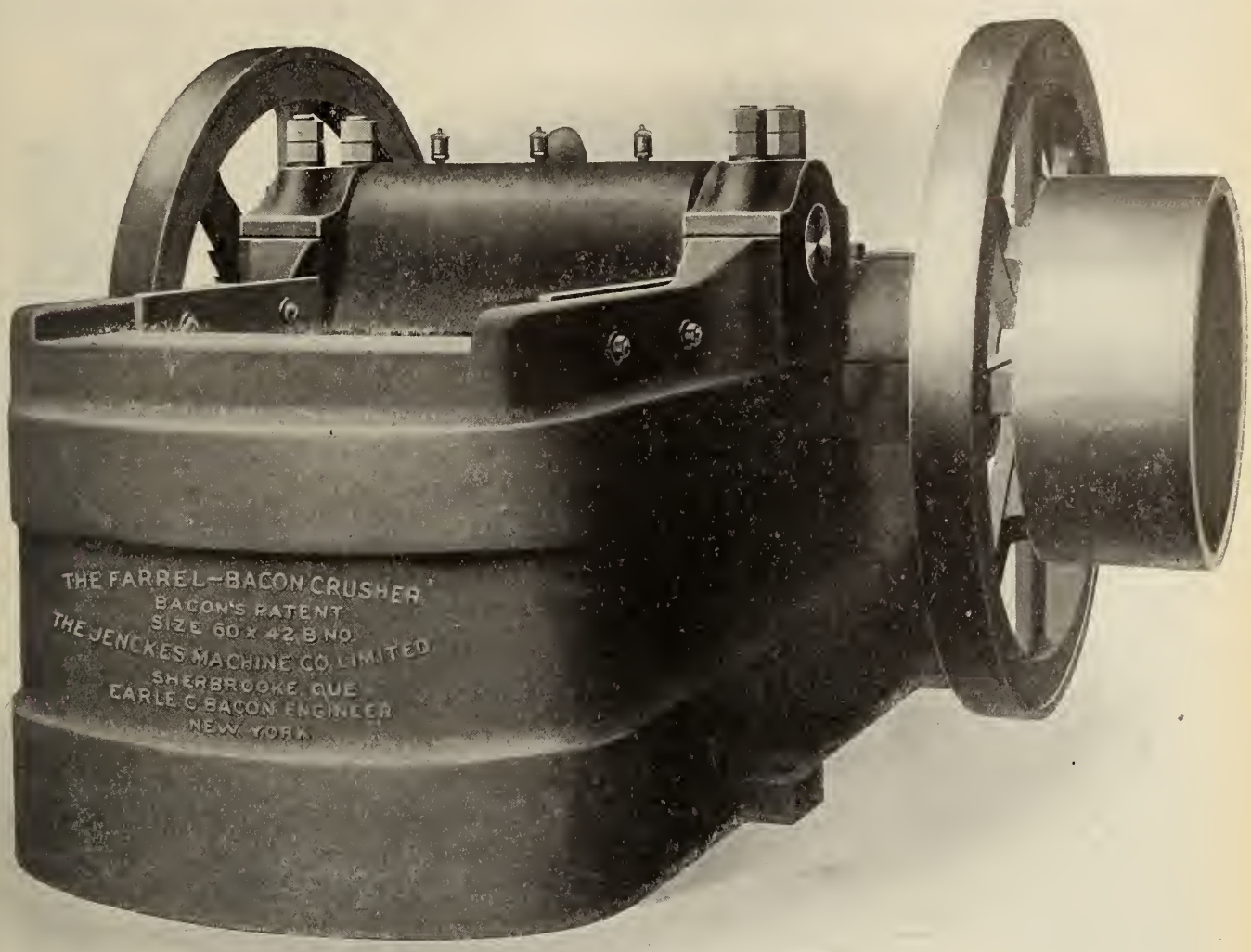

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WITH DEEP FRAME

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No.	Size of Rec'g Capacity	Approximate Capacity in Tons, per day of 10 hours, to any one of the sizes stated.		Size of Pulley	Revs. of Pulley	H. P. Required	Total Weight	Weight of Heaviest Piece	Price with ChilledIron Jaw Plates	Price with Steel Jaw Plates
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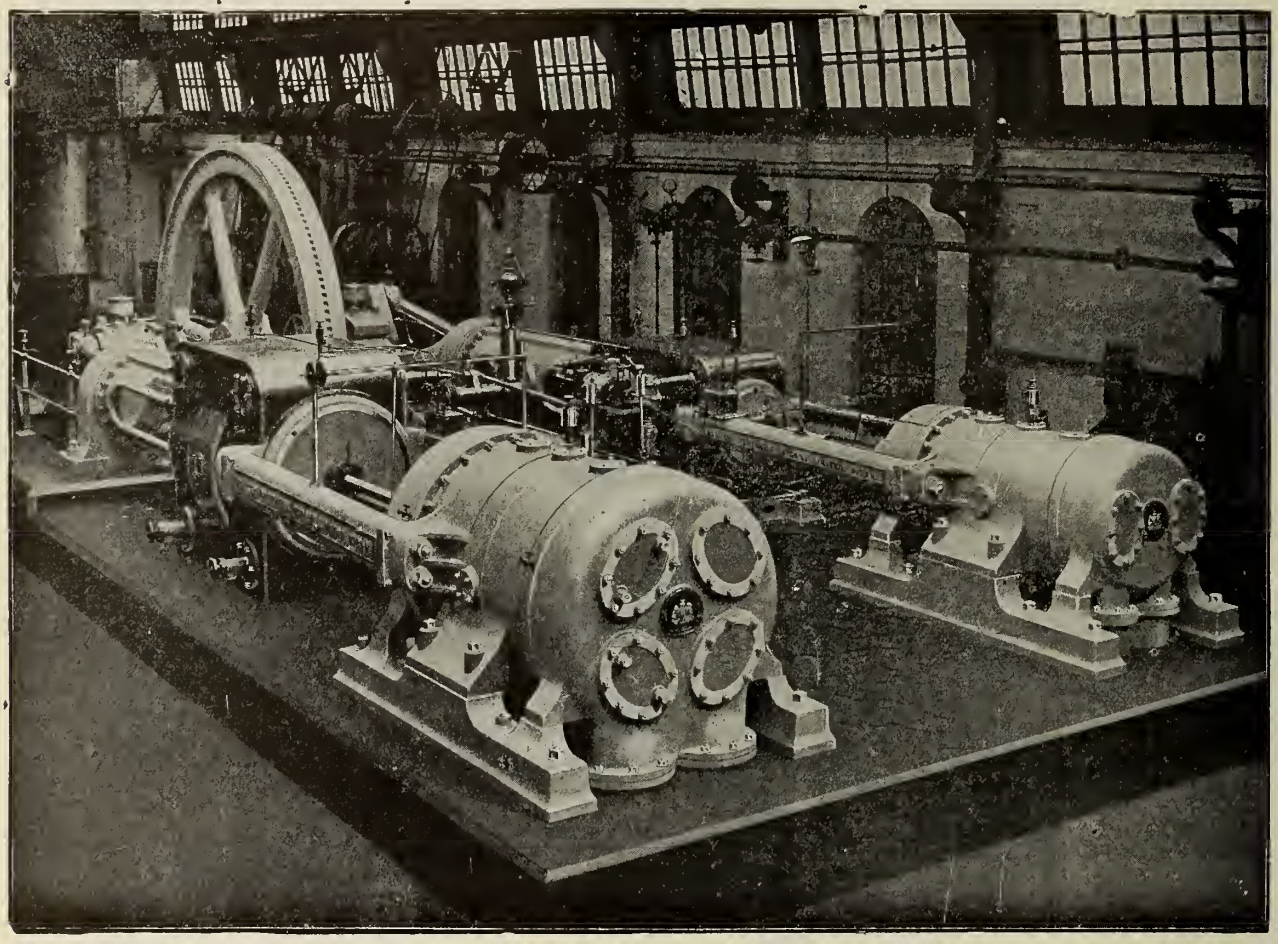

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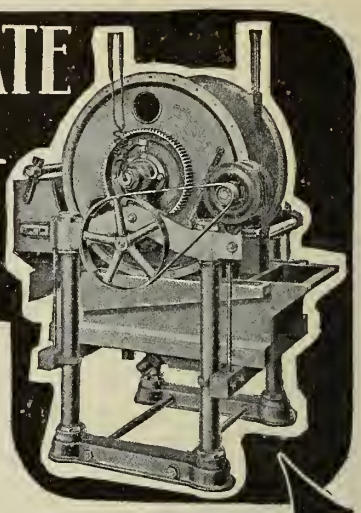

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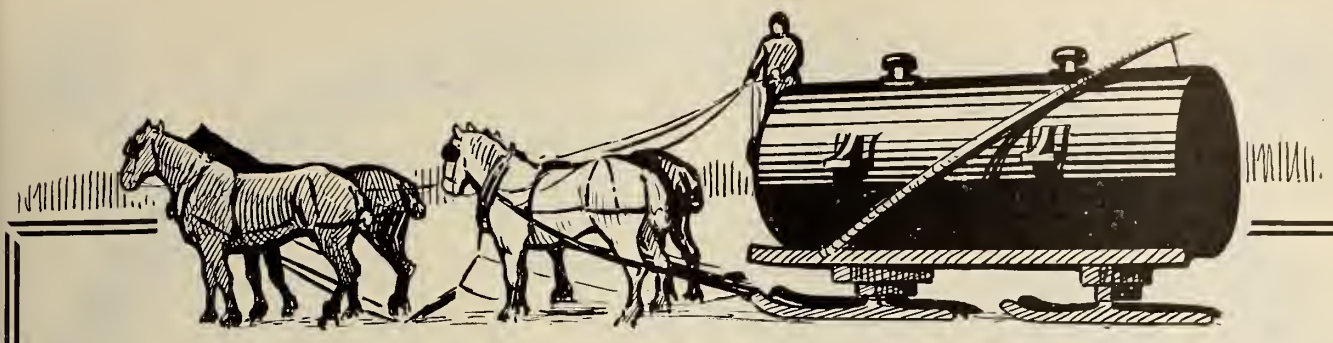

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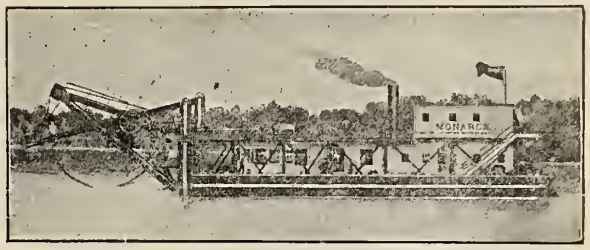

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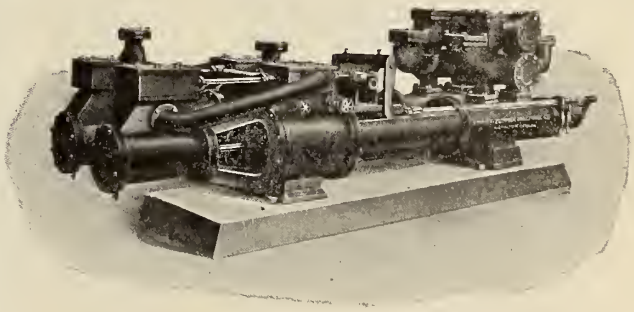

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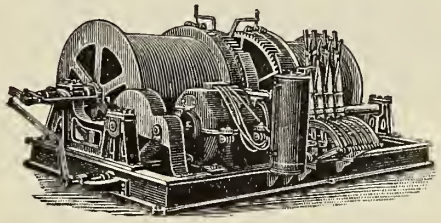

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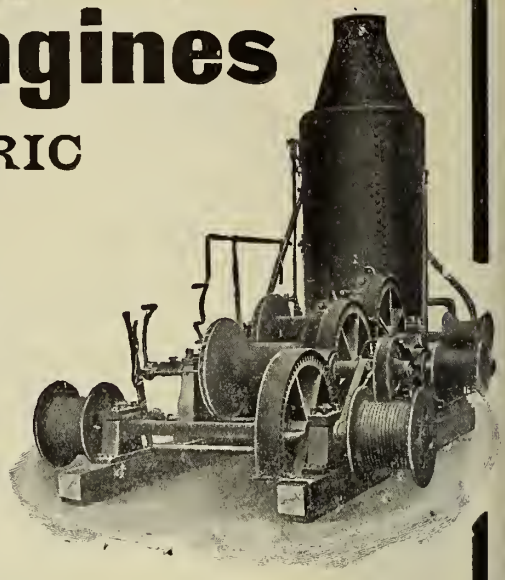

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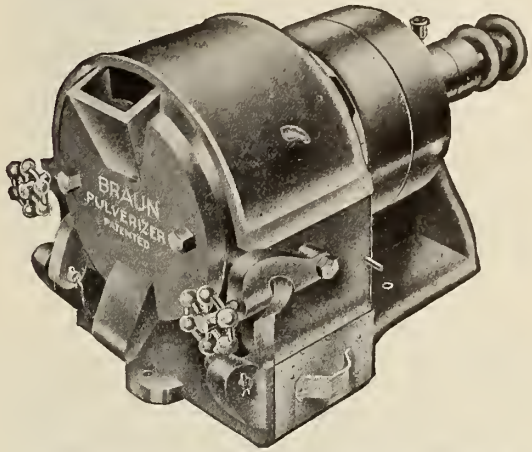

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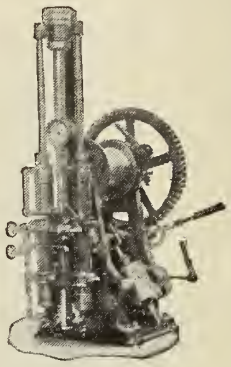

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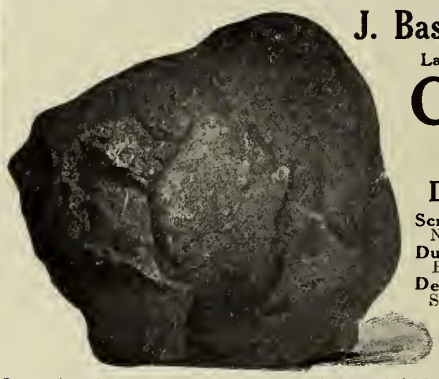

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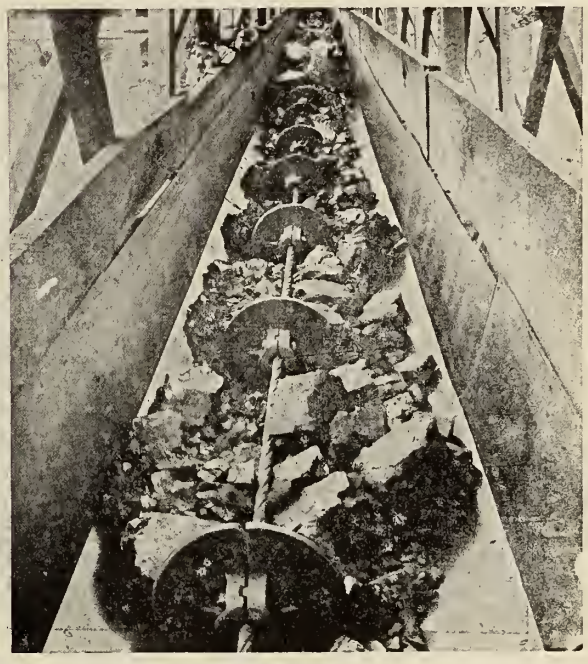

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, March 1, 1912. No. 5

The Canadian Mining Journal

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WELCOME.

Toronto has welcomed many delegations of mining men. Never before, however, has the public been so alive to the importance of the mining industry, or so interested in the proceedings of the Canadian Mining Institute.

To our English, American and other visitors from afar, we extend the warmest greetings. It may be taken for granted, no doubt, that all will have a profitable time. We hope, however, that every Canadian member of the Institute will do his best to see that our visitors lack nothing.

Here we may repeat a suggestion that has been made before. It will be well for the older members to make a point of seeing that the younger men are hospitably entreated and generally introduced to each other. To the man who knows only one or two faces in the gathering, the sessions are gloomy affairs, indeed.

Those of the visitors who wish to inspect mining districts other than Cobalt and Porcupine can easily arrange to do so. Many other Ontario mines are easily reached from Toronto. This should be borne in mind and brought to the attention of the Secretary at an early hour.

Upon all we urge the propriety of prompt and consistent attendance when papers are being read and discussed. And by all means let every member who has anything to contribute to a discussion say it promptly. The papers are merely points round which discussion should crystallize. Their value can be immensely enhanced if the several points of view are placed on record with them.

* * * * *

The Institute has never yet held an Annual Meeting that has not been the best on record. Let us see to it then that March 6th, 7th and 8th go down in history as red-letter days.

THE PICTURESQUE MR. HOOLEY.

Canada has bred a few thorough-paced financial pirates, and has imported more. In this country, however, their field has been restricted. Partly by our relative purity and partly by our reprehensible lack of imagination, we have never produced a Thomas W. Lawson or an Ernest Terah Hooley.

Of the latter it may be said that he is surpassed by no one under Heaven (above ground); neither has he his peer in sensational fiction.

An Englishman by birth, he early showed signs that he is devoid of most of the national characteristics of his fellow-countrymen. He is neither phlegmatic nor insular. Indeed, his exotic imagination, infinite daring and his disregard of conventional morality mark him as a "sport" in the evolutionary sense.

Hooley inherited a sizable fortune from his father, a Nottingham lace manufacturer. Moving to London he set up as a broker. Here, he lost no time in consummating the purchase, re-organization, and sale of the Dunlop Pneumatic Tire Co. It took him exactly three days to buy this prosperous concern for £2,000,000, and to sell it for £4,000 000, thus clearing £2,000,000 for himself. Next he purchased and re-sold a beef extract company, making £500,000.

These operations were typical. Hooley continued to acquire sound enterprises and to sell them at greatly enhanced prices. No one openly questioned his integrity. He became immensely popular and was constantly besieged by persons of title and commoners asking him to invest their money. The art of capitalizing the "guinea-pig," the avaricious lordling and the impecunious, though belted, earl, he developed to the highest pitch. His directorates read like a Court reception. He dazzled the public, he enriched many a needy peer, and, incidentally, lost his head. The crash came shortly after he conceived the idea of raising an enormous Chinese loan. Since then, deserted by his former friends, Mr. Hooley has been employed chiefly in eluding the arm of the law. At present he is spending twelve months in an English prison.

During the years of his prosperity Mr. Hooley disbursed large amounts of money in charity. To his associates he always was extremely generous. A successful coup meant prosperity for everyone who had helped him, directly or indirectly. It is worthy of note that not one of the titled persons whom he had succoured stuck by him.

In a word, Ernest Terah Hooley made money too fast. Had he been content with a modest £8,000,000, he would probably have become an honoured member of the titled ranks himself.

THE TRETHEWEY STATEMENT.

The annual report of the Trethewey Silver-Cobalt Mine, Limited, is to be presented at the meeting on February 28th. Internal dissensions are promised at date of writing. How these will result, we have no means of determining; but we think that it will be wise on the part of the shareholders to preserve the peace.

The gross revenue for the calendar year 1911, was $372.622.45; the expenditure, $221,316.04; and the net profit, $160,306.41. The corresponding figures for the preceding year were, respectively, $437,552.25; $199,-751.83; and $237,800.42. Thus there was a considerably higher expenditure in 1911, along with a notably lower net profit. Resolved into costs per ounce of silver, the total charges per ounce in 1910 were 23 cents, whilst in 1911 they ran up to 27.5 cents.

"The decrease in production in 1911 as compared with 1910," so runs the report, "is accounted for by the fact that a large proportion of the milling ore dealt with during the year was taken from old workings from which the original high-grade veins had been removed, thus reducing the average value of the mill heads with a consequent reduction in the value of the jig and table concentrates produced." The enlarged expenditure, it is stated, was incurred in underground exploration and development; and it is worthy of note that this outlay has been charged, not to capital ,but to operating account.

From the report we learn further that the east central portion of the property has been only very slightly explored. Of the 43 acres owned by the company, considerably less than 12 have been systematically explored, and preliminary work only has been performed on part of the remaining area. There may be, no doubt there is, room for difference of opinion as to the possibilities of the unworked acreage. But few will consider it wise to discontinue or narrowly circumscribe prospecting. A mine that has produced more than four million ounces of silver from a small part of its probably productive territory is not to be lightly regarded.

The company had on December 31st, 1911, a cash balance of nearly $60,000. The net value of ore in transit, at the smelter, or ready to ship, exceeded $145,-000. Other items, not including of course the book value of the mine, bring the liquid assets up by some thousands of dollars. The company is, therefore, in fairly good financial shape.

The crux of the future lies in the result of underground prospecting and development. No informed person could advocate any other policy than that of pushing development with the utmost vigour. That ore resources can be blocked out during the current year is highly probable. This should be done even at the cost of cutting down shipments. In fact, unless the management trusts to luck, there is no other alternative.

The insurgent shareholders are demanding a new directorate, monthly reports of progress, and the appointment of a consulting engineer. The second demand, we understand, is superfluous. Monthly bulletins already reach those interested. The third request is reasonable, provided always that the right

man is secured. A consulting engineer who is not entirely in sympathy with the manager is not to be desired.

It will be only decent to avoid such a foolish fuss as has been made over Temiskaming affairs. The men who control the Temiskaming needlessly gave an opening to loud-mouthed dealers in wind. Had the interests of the shareholders been consistently studied, had they been kept fully informed, the utterly silly scene enacted at the Temiskaming annual meeting would never have been enacted.

Finally, unless there is grave cause for complaint, a sweeping change of the Trethewey's directorate would be ill-advised. It takes some time to learn the business. New blood should be injected carefully and gradually.

QUEEN'S UNIVERSITY.

It has been resolved to make Queen's University a non-denominational institution. The struggle to retain a definite connection with the Presbyterian Church was protracted and bitter. It was also the manifest sign of a narrow clerical policy.

Certain citizens of Hebrew origin have been fighting at Ottawa against limiting clauses in the Bill that is intended to widen the scope of Queen's. These clauses have the effect of excluding non-Christians from office.

In our opinion these clauses are mischievous in the extreme. If the Christian religion is to be an influence for good in the future development of Queen's University, it will be all the more so if the University is thrown wide open. The use of "tests" has lost all meaning to-day. What earthly, or heavenly, right has any institution to exclude from office any class of good Canadians? If Queen's is to be national let her be genuinely national. Otherwise there is no possible reason to hope for the support, moral or financial, of the great majority of her graduates. And, as to the School of Mining, which is closely affiliated to the University, any arbitrary restrictions of the field from which professors are to be chosen will not be tolerated for a moment.

It is high time that all this blundering foolishness and non-Christian bigotry were done with.

THE INVESTOR.

Of all the errors to which the mining investor is liable that of choosing wrongly his technical adviser is the most frequently committed. This applies as well to the Canadian as to the foreign investor.

In writing on this subject we are quite conscious of being trite, of treading ground that has been covered time and time again. Yet there is virtue in repetition, especially at this stirring season.

Those who put money into the exploitation of our mineral deposits may be divided into classes. First, we have the large corporation employing its own engineers and, usually, well provided with the sinews of war. Second comes the specially organized joint stock company promoted for the express purpose of acquiring and developing one or more particular properties, and depending for its future existence upon the success of one venture. Into the third category falls the private investor who employs prospectors, acquires claims, or purchases prospects or mines.

As for the first mentioned class, no large Canadian corporation can be pardoned for employing incompetent or unsuitable engineers. Professional knowledge and attainments are not everything. The art of approaching and handling men; the knowledge of local habits, customs and traditions; and the possession of that vague but vastly important quality that for lack of a better name is termed "horse sense" are all essentials. In short, the engineer who is to do business for a corporation in this country should know Canada and Canadian temperaments, and should have a grasp of the geology of Canada and of Canadian mining history.

In many cases it is difficult, if not impossible, for mining engineers from other countries justly to appraise prospects and mines in Canada in the limited time usually at their disposal. Therefore it is wise for such engineers always to seek the guidance of a Canadian fellow-engineer.

The newly incorporated company, the second broad division, frequently expects the engineer not to write a report of things as they are, but an ardent prospectus of things as they should be.

The private investor is an uncontrollable quantity. If he goes wrong he damns mining and all that pertains thereto. If fortune smiles upon him, he takes the whole credit to himself.

It is to those who have no immediate means of directing themselves aright, the foreign corporations and investors, that we proffer a word of warning.

Many times complaints have reached our editorial ears concerning the uncertainty of obtaining a competent Canadian engineer who is able to give a straight and reliable report. These complaints, naturally, have come mainly from Americans and Europeans. And they are genuine. The outsider, other things being equal, really prefers to employ a person conversant with Canadian men and methods. But unless he has ample time to look round for himself, he is up against a real obstacle. Professional cards are not published by all engineers. Not all professional cards have "the goods" behind them. Not every practitioner who sports "M.E." after his name is competent. Among the elect only a few are specially qualified to guide the would-be investor in any one or two branches of mining. How is the stranger to judge?

This is not an easy question to answer. It must be confessed that the most experienced engineer runs the risk of blundering when he goes outside of his specialty. For instance, a professional man who has devoted most of his time to gold is seldom able to adjust his mind to the totally different requirements of iron ore mining. The coal specialist is not likely to be an authority on placers. These things are obvious enough. Yet it is not seldom that the mining engineer is placed by circumstances, or consents to place himself in the false position of posing as an expert in matters of which he knows only the rudiments.

If, therefore, the investor wishes to make sure of his man, it is apparent that strict inquiry is necessary. Where and how is this inquiry to be made? Mining engineering is not a close profession. There is no strictly professional society of mining engineers in Canada. And, as a matter of fact, casual inquiry will often elicit warm commendations of a mining engineer from his acquaintances solely because of his personality with no reference to his experience or his ability. For these and other reasons, the inquirer must go to certain sources.

For the purpose of engaging a reliable Canadian engineer, then, enquiry may be made of the Geological Survey at Ottawa, and of certain of the Provincial Departments of Mines. But the prime sources of information should be the Universities and the Canadian Mining Institue. At all the Universities lists of mining graduates are kept, and the whereabouts of each living graduate are known. The secretary of the Canadian Mining Institute, also, can supply a list of names from which a suitably qualified engineer can be picked. And, incidentally, the Canadian Mining Journal is always willing to be of service in submitting a similar list, or in obtaining specific facts relating to any given engineer.

Hence there should be no insuperable obstacle in the way. If pains be taken in seeking the right man, and if his advice be followed intelligently, then more than half the battle is won.

It may be mentioned here that English capital has been squandered in Canadian mining ventures to a greater extent than has that from any other country. The real cause, the only cause, has been the neglect of the simple precautions outlined above.

THE BRITISH COAL STRIKE.

Most ominous is the news from Great Britain as we go to press. Friday, the 1st of March, and the succeeding two or three days may witness the calling out of every coal miner in England, Wales, and Scotland. All attempts at conciliation have, seemingly, been abortive. Obsessed with the idea that they command the sympathy of all the labouring classes, and believing that their Parliamentary representatives are no longer working in their interests, the miners, or, rather, the demagogues whom the miners follow blindly, are ready to stop all work on Friday morning.

The nominal cause of this impending disaster, for disaster a strike of such magnitude will be, is the refusal of the owners to grant a minimum wage scale. The real cause is traceable to the sweeping victory of the miners some time ago when they obtained the Eight Hour Day. Intoxicated with that success, the labour leaders have been planning this final coup.

The chief hope for an eleventh hour settlement of the trouble lies in the fact that the owners may make temporary concessions pending the decision of a court of arbitration. Rumour also has it that the Government has offered to make good to the owners any loss that may be incurred by a limited trial of a minimum wage scale. But there is no certainty about this. The results of all conferences are kept absolutely quiet.

It is hardly believable that the miners can fully understand what indescribable loss the proposed strike would bring upon the whole nation. They themselves would not be the chief sufferers. Upon the poorer city classes, the strike would bring the intolerable hardships. Fuel is costly enough at all times. But when even the rich would experience difficulty in obtaining coal, the position of the poor can be left to the imagination. This is really the most serious aspect of the case.

The dislocation of international commerce, the paralysing of internal traffic and of trade generally, are necessary concomitants of even a few days of strike conditions. Protracted cessation of work would be a calamity of the first magnitude.

The significant fact is that the miners respond eagerly to the demagogue, and refuse to listen to the saner councils of their own Parliamentary representatives. No final settlement will be practicable until the agitator is muzzled. The most effective muzzle is a closer understanding between master and man.

OBITUARY.

The Late Hon. B. F. Pearson, K.C.

On the evening of January 31st, there died at Halifax, N.S., the Hon. B. F. Pearson, K.C.

Benjamin Franklin Pearson was a native of Colchester County, Nova Scotia. He was born at Truro, the county town, 67 years ago. Admitted to the Bar in the year 1881, Mr. Pearson early showed that his energies could not be confined to the practice of law. In 1889, he arranged for the purchase of the telephone rights of the Bell Telephone Company in Nova Scotia, and proceeded to organize the present Nova Scotia Telephone Company. A few years later he became the moving spirit in organizing the Dominion Coal Company and the Dominion Steel Company. Many West Indian and Mexican traction and other ventures were due to his initiative. He was an active member of the Provincial Liberal cabinet for some years, and for a long time was prominent in political affairs. The Halifax Morning Chronicle was controlled by him.

CORRESPONDENCE

MORE PETROLEUM.

The Editor, Canadian Mining Journal:

Sir,—I consider the letter of Mr. J. F. Latimer, published in the issue of the Journal for January 1st, more as an incentive for a discussion of the subject whereof he writes, than as calling for adverse or favourable comment on the letter itself, because Mr. Latimer, according to his own confession, speaks from the standpoint of a non-student of this much discussed, but, to many, intricate subject.

It is true that those combatants whom Mr. Coste has so far succeeded in arraying on his side to aid in the defence of his hypothesis "on the origin of petroleum," are few in number, but those whom he has, are of weighty authority. Can it, however, be claimed that because the number is small, therefore the theories of his adversaries are correct? They may be as much at sea as were formerly the "lateral segregationists and dissensionists," who were fighting with every weapon to hand against the "volcanic ascensionists," and who came out second best? May not this case be analogous to the war over the theories of the old Sandberger school and Van Hise's descension theory, both of which are hardly whispered to-day? I, for my part, stand at the side of Mr. Coste and say that it not only may, but is the same.

To assert that we can jump at conclusions, from what we poor mortals are able to do and to produce in our little laboratories, as to what that gigantic and mysterious laboratory, our world, is doing and producing, is rather a strong claim. Neither do little drops of oil, that have the semblance of petroleum, found here and there near to coal beds, constitute any proof.

Have the organic theorists ever figured out how many billion tons of coal would be required to produce all those millions of barrels of petroleum or the billions of cubic feet of gas that have flowed or have been pumped out of the ground? What has become of the coke or ashes? Every particle of carbon and hydrogen must have been burned out of every existing coal-bed to furnish such immense amounts of gas and petroleum as are distributed throughout our earth's crust, to say nothing of that which must have escaped thence before mankind became interested in these phenomena. Do we find coal in such an altered condition as to furnish support to the hypothesis of the "organists?"

How would it be possible to produce such conditions? Only by the intrusions of hot lava streams into coal-bed strata. Would not, however, such extensive and intensive volcanism be accompanied by rock movements, by fissuring and perhaps faulting, and would not openings and passages be produced thereby for the escape of gas, and, if you will, oil also, into the atmosphere? Even if we suppose that the more gentle action of a laccolith had been the cause, and had not occasioned such fissuring, still, would not that large mass of hot magma have produced such an immense volume of gas, and with such suddenness, that the overlying rocks, weakened, would have been rent apart by the expansion, or even by an explosion of the gases? The latter would not have had time to escape gradually into the porous rock stratum, from which they would first have to drive out the air and water. Granting, again, that these gases might have found a subterranean store room, can any one inform us what has become of the distillation "by-products," either ashes of cinders? Has the magma made a tabula rasa with every particle of the organic or mineral residues, and then filled out the space which was formerly occupied by the coal? How grateful, then, should we be to an all-wise and benign Providence, who guarded the coal-beds that still exist, against nature's metamorphic processes and spared them to serve as a subject for our own industry!

It is unfortunate for the organic theorists that we find, at a number of places, oil and gas below the coal measures and others containing organic remains. Did they arrive there by the agency of pneumatic force? If so, what became of the air and water in those porous store-rooms? Had both been driven out beforehand? If so, and the air and moisture found an outlet somewhere, which must surely have been upward, and not downward, why not also the gas and oil? For we cannot conceive that coal beds should have been buried so long and so deeply that none of the distillation products could have escaped upwards, neither is it conceivable that the water-fauna, notwithstanding their long period of burial, should have retained the fatty and fleshy parts in such a state of preservation as to be still fit for distillation. What, then of the nitrogen? "Ah, well, the nitrogen slipped slily behind the scenes and disappeared, leaving no trace behind!" A downward course of the gases, even under pneumatic pressure, against volcanic heat, would imply a defiance of every physical law that stood in their way.

I have just read an extract from a report on "the Gas Occurrence of the Kent Field," written by my friend, G. R. Mickel, who estimates the probable output at 70,000 million cubic feet. Quite a substantial volume! Were we to confine this in a square gas-holder, such a holder would be represented by a cube, each of the sides of which would be 19,130 feet long, and for the production of this amount of gas there would be required about 7,000,000 tons of good gas coal. What has become of the resultant ash and cinders? What has taken the place of the carbon and hydrogen? Gas, and perhaps oil? If so, the gas drillers and oil pumpers should be on the lookout or they might some day take an involuntary slide into the "nether world!"

Our friends on the other side of this controversy might say, "Neither the gas nor oil came from coal at all, they came from the inhabitants of our lakes and seas, from the tiniest housed creature, to the biggest ammonites, from the smallest unhoused being to the largest monster of the deep—'sea-serpents' not excluded."

Let us analyse this hypothesis somewhat closer, let us follow the different phases of the decaying process on the body of a large animal thrown into the water. First, we will see it sink down; second, it will soon swell up, through the evolution of gases produced by the oxidation of the hydro-carbons and nitrogenous parts of its interior, confined by the surrounding skins; third, it is lifted to the surface like an inflated balloon; fourth, the process of decomposition continues, the skins are punctured, the gases escape, water may or may not take their place, the body sinks down again and falls a prey to crustaces or other creatures of unrefined taste.

And this is the speedy end of flesh, fat, gas, oil and whatever else will not withstand the gnawing teeth of animals and time. In most cases, however, we will not see the body again after its first fall into the water, for it will be devoured before it has time to rise again. The above illustration holds good for our warm and moderately warm inland lakes; for the cold waters of Lake Superior or the waters of the Arctic or Antarctic regions, it must be somewhat modified. But what we observe taking place in our warmer climes we have to accept as taking place still more readily in pre- and post-carboniferous, Jurassic and later epochs and even more so in early Silurian and Devonian times, because much higher temperatures prevailed then, and very likely there were also a greater number of preying animals. Has ever an anthropologist found the complete body of a man, or a zoologist the intact body of an animal, except such as were discovered buried in ice? Or has ever a malagologist or conchologist found a mollusk of earlier periods with its interior absolutely intact, although, perhaps fossilized?

If we examine the remains of a prehistoric fauna, they appear only in rare instances to have suffered any change through either heat or crushing, through pressure, conditions which we would expect to observe if volcanism had in one way or the other acted upon them.

What would it mean to distil or press the billions and billions of cubic feet of hydro-carbon gas, and the millions and millions of barrels of oil that has existed and still does exist in the folds of the earth's crust, out of lacustrine sediments, however large they may be? It would mean that all the deposits of animal remains of which we have knowledge are absolutely insufficient to produce all the hydro-carbon masses which have been so far collected, not to mention those as yet untouched. It would also mean that all these animal remains had to be in an undecomposed condition, in order to be fit to yield the products mentioned. It is simply inconceivable that they should have remained intact for thousands of years, until a covering sufficiently thick and impermeable had formed over them to oppose the escape of the gases. Let us consider only the time necessary to form the hundreds or thousands of feet of lacustrine or marine sediments, to say nothing of the additional time required to bury these sediments under an equal, or even larger covering of later, and, perhaps, varied sediments, and consider, moreover, that, while all this was going on, mollusks, fishes and other inhabitants of the waters should have been preserved intact, in death, to await their ultimate fate, to give us their fat and grease for the comfort and "enlightenment" of the human race!

What, now, about the hypothesis of the "Plutonists?" I think that every geologist, mineralogist, naturalist, or whosoever has interested himself in the structure and the material of which our globe consists, be it from its earliest history to the most recent times, will have found that carbon in different forms has been ejected from the interior of our globe, either in combination with various magmas, or exhaled in combination with different gases, and at all periods, not only in minute, but often in considerable quantities, it being then distributed over and throughout large areas of our earth's crust. In this connection I may also mention that doubtless immense quantities were diffused into and throughout our atmosphere, forming later a partial source for plant and animal life. But the careful observer will have also found that organisms containing carbon were not in existence prior to Cambrian times, at least, there is no trace of any such organism having been discovered, for Logan's and Dawson's Eozoon Canadensis was an erroneous determination.

Let us briefly review those rocks in which we have discovered carbon in larger or smaller quantities. I shall take my examples from our two most western districts, these furnishing examples of the oldest rocks of our earth's crust more plainly than any of which I have knowledge.

Beginning with the oldest representatives, the Keewatin, we find in numerous places carbon in the form of graphite. Next in order, in the Laurentian granites we find carbon dioxide in the miarolites. In the pre-Cambrian we find the next oldest deposits in the following order: Graphite in the ejectments of our trap volcanoes, distributed over a considerable area and thickness, a graphitic diabase heavily saturated, gabbros containing graphite in veinlike deposits, peridotites with graphite granules, heavy coatings of graphite along the walls of our trap dykes, in our silver veins, and a very inflammable carbon hydrogen gas in the same veins, anthraxolite in fault fissures of archaean rocks and Animikie slates, the latter also saturated in places with hydrocarbons. The last in order in our districts would be the Keewenawan or Nepigon dolomite, and the last ejected diabase rocks, containing considerable quantities of graphite.

Now, what can be shown to have occurred in the earliest history of our globe, in our locality, has also been taking place in other parts of the world, and in later epochs perhaps upon even a larger scale, but better retained, in larger masses, in porous rocks, where the gases could lodge and condense. If all those carbon gases from the still active mofettes and solfatara were caught in subterranean store rooms, natural gas and naphtha would be constantly produced. It is possible that in earlier periods the metallic carbides may have been more abundant towards the surface of the molten interior, securing an easier channel for escape, while now, owing to the greater pressure exerted by the thicker envelope of the earth's crust, they are more compressed and, therefore, more confined. However, we learn that, in the Baku fields, the naphtha is still flowing, and is welling out a number of places; if this is the case, then the same phenomenon is occurring in our Athabasca River field, where naphtha and tar are oozing out of the banks of the river, having, as a result, asphalted the river bed to an almost smooth floor. In the Baku fields we have historical evidence that the "holy fires" have been burning there for thousands of years, and from Athabasca we know that the Indians and half-breeds have painted their dwellings with this product for many years. In 1894 the Dominion Government drilled a well on Pelican Portage on the Athabasca River, striking the gas at 800 feet. It shot out with such tremendous force that all hope of stopping it was abandoned, and the well has been flowing ever since.

Now, when a person is told that these enormous stores of gas and oil are produced by the distillation of organic substances, he wonders whether he is not being made the target of a poor joke.

Proof of the unsoundness of the organic theory could be brought forward ad infinitum, but I am afraid tha

I have trespassed to the limit of the space that you, Mr. Editor, can allow me. I would only desire to add that, if in my arguments I have trespassed upon ground which Mr. Coste can claim to have covered, I ask for absolution, because I have not had the pleasure of studying Mr. Coste's contributions on this subject, except one only, and that published several years ago.

F. HILLE, M.E.

Port Arthur, Ont., Feb. 1, 1912.

LAKE OF THE WOODS.

The Editor The Canadian Mining Journal,
Toronto, Ont.

Sir,—Owing to my duties in the Legislative Assembly I have not had the time I should like to prepare an article on the possibilities of the Lake of the Woods, Rainy River and Manitou mining districts. However, since you were good enough to ask me to write a short letter of my opinion on this subject, I am glad to avail myself of your kind offer in order to reach the mining and investing public through your valuable paper.

I have noticed with a great deal of pleasure the references your Journal has made from time to time concerning these districts, and particularly the able article, which appeared recently, written by Mr. Carter, former Government Inspector of Mines.

While we who live in the districts named above rejoice in the good fortunes of those now engaged in gold mining in the Porcupine districts, and the strong tone the discoveries in that country have given to the mining of precious metals generally in Ontario, yet we feel that we have in the Lake of the Woods country just as good properties and prospects as they have in the Porcupine country. We say that if we had some of the experienced and capable men who are now operating in the Porcupine country, plus the capital they have behind them that in a year from now the Lake of the Woods would make a different showing. We have had a bad "black eye" attributable to many causes, but I think Mr. Carter's article explains former conditions far better than I can.

I believe that as a result of the Porcupine discoveries and the re-establishing of Ontario's claim as a gold producing country we have felt the benefit of the faith which the mining investing public have become imbued with as a result of those discoveries. During the past two years a great deal of quiet work has been done in the Lake of the Woods and adjoining districts, with a result that to-day we find the St. Anthony working in the Sturgeon Lake district, and other steady work going on around it to a smaller degree. The old Laurentian, now known as the Great Golconda, in the Manitou district, is at work again, as well as other properties in its neighbourhood. The Bewick-Moreing Company is developing a promising prospect at Dryden, some sixty miles east of Kenora on the Canadian Pacific Railway, as a result of which quite a stir of activity is going on in that section; and in the Lake of the Woods proper we find Buffalo people steadily carrying on work at the old Scramble property. This is a large low-grade proposition, which when worked on a large scale, as proposed, by electrical power, should instil faith into the doubting public. The transmission line is under construction, and power will be obtained from the town of Kenora, which owns and operates a valuable developed water power The engineer in charge of this work is Mr. Charles Brent, M.E., whose past experience in that country has undoubtedly proved of great value, since the cautious and workmanlike manner in which the present development work is being carried on, without a word being said or any blowing of trumpets, spells success. I understand that a consolidation of certain valuable mines and prospects has been made by Judge Fishback, of Chicago. The famous "Ophir" property, the subject of so much litigation in former years, forms, I believe, the nucleus of the consolidation. A company with a $5,000,000 capital has been formed to work these properties, and for some time past steady development work has been going on at the Ophir under the management of Mr. R. B. Nickerson, M.E., of California. The Olympia mine on Shoal Lake, adjoining the "Mikado," has been working quietly for some time in a small way, and I understand that five stamps have been dropping for some time with good results. I know that gold bars have been produced, but to what amount I cannot say. Other properties were worked last summer, by way of development only, and doubtless will resume next summer.

Some months ago a Winnipeg syndicate did a lot of diamond drilling on a large body or iron ore on Stormy Lake, south of the C.P.R. station of Dinorwic, and I am told that the results were entirely satisfactory. The work was supervised by an engineer from Robt. W. Hunt & Company, of Chicago. After drilling through five hundred feet of high-grade magnetite, work was suspended.

Some eighteen miles from Kenora, Dr. Scovil and Captain Kendall have done considerable work on some copper properties. Results have apparently been satisfactory.

I recite some of these instances, and there are plenty of others, simply to show the extent of the mineral fields of Northern Ontario, which, by the way, cover some thousand miles west of the T. & N. O. Railway (Toronto newspapers in general to the contrary notwithstanding), and the great chances for the mining public to investigate for themselves, and not simply to turn us down because others have told them that the districts I speak of are no good.

To repeat, if in the days of our glory we had had the men of experience now operating in Porcupine, plus the money they have behind them, plus the modern methods they are now using of winning the gold, the history of the Lake of the Woods would have been very different, and the Annual Report of the Bureau of Mines during the past fifteen years would have made very interesting reading as regards these districts and their gold production.

Yours very truly,

H. A. C. MACHIN.

Legislative Assembly, Toronto,
Toronto, 21st February, 1912.

OPPORTUNITIES IN THE WEST.

(Written for the Canadian Mining Journal.)

The history of mining development in Canada shows that it goes forward by sudden impulsive movements following the announcement and proving of the latest "discovery." This was particularly true of placer mining; but it is also true of lode mining—in a more moderate form, however. In the later case there is a more permanent industry established and left working after the "stampede" has passed on to the next strike.

It so happens that the public eye is so focussed on the better known fields that other districts, perhaps equally worth while, but not so well advertised or known, are comparatively neglected. An illustration is to be seen in the marvellous development of mining in Northern Ontario on the one hand and the comparatively neglected opportunities for investment in the northern portions of our two Western provinces.

From Edmonton, Alta., westward to the Pacific coast along the lines of the two new transcontinental railways, a distance of 800 miles, there is only one producing mine, viz.: a colliery with an output of about 100 tons of coal a day. It is not to be inferred from this, that the country traversed by these lines is without valuable mineral deposits, on the contrary many (a very great many) discoveries have been made and recorded, but, as a rule, little development work has been done.

The number of recent discoveries having rich surface showings in the Bulkley Valley, should have awakened more interest than they have done. The term Bulkley Valley is used here to include such adjoining areas as the Babine Mountains, Hudson's Bay Mountain, Roche a Boule, the tributary valley of the Telkwa, and part of the main valley of the Skeena River. Some spectacularly rich samples of bornite with native silver have been brought in by prospectors. On a few of these properties considerable work has been done; but in the great majority of cases no serious attempts have been made toward development.

There are also other promising districts along the route of these two railways, for example, the valley of the North Thompson River, the vicinity of the Yellowhead Pass, and around Tete Jaune Cache.

Turning to the question of coal mining we find, first, that in the neighbourhood of Edmonton there are numerous properties containing lignitic coals which would be a profitable investment if operated economically and with a small plant. Going westward there is a gradual improvement in quality until, at the edge of the mountains, the highest grade bituminous coals are found. There should be, in fact there inevitably will be, a great development in the coal mining industry of this part of the country; but, probably for the reasons first given above, this development is much slower than it should be. Why should Pennsylvania coal be used for locomotive fuel at Edmonton and westward of Edmonton when there is, on the main line of the railways, coal of just as good quality and equally suitable for locomotive use?

It is of particular interest to note that farther west on the Skeena River there is a field of hard coal. It is distant 100 and 125 miles respectively from tidewater and from present railway lines. When transportation facilities are available this field will play an important part in the Western coal supply.

OPPORTUNITIES IN THE IRON INDUSTRY IN CANADA

Written for The Canadian Mining Journal by A. B. Willmott.

A study of the Trade and Navigation Returns of Canada shows the following importations of iron and steel goods:—

	1908	1909	1910
Imports of iron and steel subject to duty	$51,485,456	$33,083,397	
Imports of iron and steel free of duty	10,334,242	7,310,034	
Total imports	$61,819,698	$40,393,431	

Many of these articles are highly manufactured and we can hardly expect that their production should be undertaken in Canada. The weight of these iron and steel manufactures is largely unknown. Included, however, in the figures presented above are a large number of partially manufactured products which could well be made in Canada and of which the tonnage is known. These are given in detail below:—

Imports of Some Iron and Steel Products of Which the Quantities are Available.

Material.	Twelve Months ending March, 1908. Short Tons.	Twelve Months ending March, 1909. Short Tons.	March, 1910. Short Tons.
Pig Iron	212,290	58,591	
Ferro-products and chrome steel	17,661	13,206	
Ingots, blooms, billets, puddled bars, etc.	21,222	8,887	
Scrap and scrap steel.	69,213	26,212	
Plates and sheets	126,172	101,317	
Bars, rods, hoops, bands, etc.	98,631	69,818	
Structural iron and steel.	373,871	162,735	
Rails and connections.	52,706	32,543	
Pipes and fittings	25,090	18,309	
Nails and spikes	2,741	1,432	
Wire.	57,046	39,452	

Forgings, castings, and manufactures.	22,357	13,092	
Total.	1,079,000	545,594	

With the importation of iron and steel goods varying from $40,000,000 to $62,000,000 a year there should be many opportunities for profitable investments in the iron and steel industries. The character of the opening will vary with the locality selected. Markets, source of raw material and transportation facilities as well as labour costs must be considered in looking into the possibilities of new ventures. These opportunities may be discussed in a general way province by province.

British Columbia.

This province has yet but a small population, but is rich in natural resources and a huge development is now taking place. Numerous railways must be built, bridges constructed, elevators, wharfs, manufactories and other buildings erected, all of which make extensive demands for iron and steel goods. Owing to high railway freights the province is best served at present by importations from abroad, by vessel. Pig iron, which may be taken as an index, sells around $23.00 and is furnished largely from Great Britain. Freight and duty alone amount to $9.00 a ton. This is a protection in favour of the British Columbia producer of pig iron which will be largely permanent in character and amounts to practically fifty per cent.

The raw materials for the establishment of an iron industry exist in abundance in British Columbia and all are very conveniently located for cheap assembly. Iron ore, coal and limestone all occur within a few miles of the sea and near the centre of population. The iron ores are largely magnetites, high in iron, low in phosphorus, but contaminated with sulphur. The consumption of pig iron in the province is, of course, small, owing to its high cost. With cheaper pig iron undoubtedly a large number of consumers would spring into existence. Many supplies for lumbering, mining and railways could be produced more cheaply on the coast than they could be imported from abroad.

Alberta and Saskatchewan.

These two provinces are very rapidly settling and the demands for pig iron for foundry purposes are bound to increase enormously. At present pig iron, owing to the long distance it must be transported, sells at $25.00 to $27.00 a ton. If pig iron could be furnished at a reasonable price local foundries would spring into existence in all the larger towns and cities. Repair work on agricultural implements, local manufactures, stoves, cast-iron pipe and other things would speedily make a demand for the output of a local furnace. The mining camps of the Crow's Nest Pass and South-Eastern Kootenay would also furnish a market.

It is believed the raw materials for such an enterprise could be cheaply assembled at some point on the Crow's Nest Pass Railway. Coke and limestone of excellent quality are abundant and good hematite ore is also reported, though little is yet definitely known about the quantity.

Manitoba and Western Ontario.

In Manitoba again there is already a considerable demand for pig iron for foundry purposes and, as in the Prairie Provinces, the price is unduly high, because of the length of transportation from producing centres. Manitoba is, however, not as favourably situated as Alberta, owing to the absence of suitable coal. On the Winnipeg River, however, in the adjoining part of Ontario, numerous water-powers occur. If there is any place in the Dominion where electric smelting of pig iron would be successful it would seem to be in this vicinity. Water power is cheap, coke is dear; the market for pig iron is at hand and the price of pig iron made by coke is unduly high. Moreover, in Western Ontario large quantities of iron ore are known, though frequently these are somewhat off grade. At several points the ores are low in iron, due to admixture with silica, but are reasonably free from phosphorus, sulphur and titanium. These could be undoubtedly concentrated and the concentrates smelted directly in an electric furnace. On the Atikokan River are larger deposits of ore high enough in iron, but contaminated with sulphur. This, however, does not seem to be objectionable in the production of electric pig. The project of such a plant operating at Kenora or some similar point where power is cheap and transportation good, seems to be worthy of careful consideration.

Ontario and Quebec.

In the central part of Canada are located the bulk of the iron furnaces of Canada. Here also are most of the manufactories working up the pig iron into a higher state of production. At the same time, as shown in the statistics given at the beginning of this article, there is a tremendous importation into Canada of iron and steel goods and it may be safely asserted that the bulk of these importations are made into Ontario and Quebec. A study of the Trade and Navigation Returns of the various importations will richly repay persons looking for investments.

Another line of investment in Ontario and Quebec would be the production of iron ore for sale to existing smelters. The following table shows the production of iron ore in Ontario and also the consumption:

	1909	1910	1911
Production	263,893	230,656	
Consumption	763,851	822,174	

From this it is apparent that Ontario is smelting about three times as much as she is producing. The case is even worse for a part of the Ontario production is exported and so still more has to be imported. There are numerous known occurrences of iron ore throughout the province awaiting exploration and development.

The Maritime Provinces.

The iron industry of the Eastern Provinces centres at Sydney, Cape Breton, though there are also furnaces on the main land of Nova Scotia. By far the larger part of the iron ore is imported from Newfoundland. Ore is also furnished from Bathurst, New Brunswick, and Torbrook, Nova Scotia. Coal and coke is of local origin near the furnaces. The plants at Sydney are particularly well located for the assembly of raw material cheaply. It would seem, however, as though the iron ores of these two provinces might be developed more energetically than has been done and so supply a larger part of their own requirements. Iron and steel industries depending on the pig iron, billets and rods made at Sydney should be economically located in that vicinity. Again a study of the Trade and Navigation Returns should prove valuable.

NORTHERN ONTARIO—*THE LAND OF PROMISE*

Written for the Canadian Mining Journal by
Ben. Hughes.*

Four years ago in Northern Ontario there was one hectic spot of furious and, to a certain extent, spurious activity at Cobalt. North, south, east, west as far as the mining industry was concerned, there was a vast wilderness of pre-Cambrian rocks untravelled except by the lumberman and the trapper. In Coleman Township the promoter and the broker raged up and down, beyond its bounds the grey timber wolf still pursued the deer and the forest acknowledged the overlordship of moose and bear. Pioneered by the few Western men in the camp the Ontario farmer's son and the Ottawa Valley lumberjack were commencing to spread far and wide in search of the little calcite vein. A few men were coming down with fairy stories from Larder Lake, and, presently, the most shameful capitalizing of the stunted jackpine and the frozen lake would prevail to the north. The daily press wittingly or unwittingly gave itself unreservedly to the pronouncements of the mining fakirs, and the country school teacher and small shopkeeper bled their treasured dollars into the hands of get-rich-quick gentlemen in Toronto. The air rang with ecstatic shouts of Cobalt! Cobalt! Cobalt!

To a measurable extent the mining industry has become decentralized, or, rather, the calcium light that burnt so brilliantly on Cobalt in the early days, has now been transformed into a search light sweeping the northern woods. When Cobalt has fallen into the hands of the lessees, as it surely will some day, there will be Gowganda and South Lorrain still to remind the outer world that Northern Ontario is argentiferous. Beyond the height of land it appears to be as futile to look for silver in payable quantities as it is to discover the yellow metal in the Temagami and Temiskaming regions, and it is a matter of great probability that Porcupine will be reinforced and buttressed in the days to come by a number of small mining settlements set here and there hundred of miles apart in the bush north and south, east and west of that wonderful colonizing agency, the Transcontinental

Take what we have to-day. There is a mine and a prospect at Swastika, a mine and a prospect at Larder Lake, and some prospects at Munro and Painkiller. All are worthy of investigation and the expenditure of money. So far these smaller centres of activity have not produced, but if they were all as competently managed and as comfortably financed as the Swastika is to-day, gold bars might be a daily item in the express lists. Till Porcupine demanded the attention of the mining world it was common policy to put an ex-lumberman in charge of a prospect, because he knew how to timber a shaft, or a bookkeeper, because he could check the men's time, or a railroad constructor, because he could break rock; but although a mining engineer could do all of these things he alone was not called. For many years the St. Anthony mine soaked up good English sovereigns, now under a competent engineer, it is furnishing gold bars for the Canadian capitalists who have bought it. And there are many St. Anthonys in Northern Ontario.

Before advancing to a discussion of the probabilities of mineral Northern Ontario it would be wise perhaps to establish a firm basis by detailing the probabilities.

There are many engineers of sound judgment and sane vision who are daring enough to declare that 1911 will not prove to be the peak load year of Cobalt's productivity, and that with the Nipissing mill transmuting its enormous dump piles into bullion and the advance of several other properties the high water mark of 32,000,000 ounces will be maintained and more than maintained. It is at any rate certain that there will be but a slight falling away and that Cobalt may be accounted the outstanding figure in the world's silver mart for years to come. When an eminent Scotch engineer went through the drifts of the Nipissing he saw twenty-ounce ore left in the walls and exclaimed that that was what they were producing dividends with in the West.

As Cobalt last year for the first time seriously undertook to make a profit out of her low-grade ore; when the Nipissing low-grade mill is operating it will be possible to estimate what ore can be mined at a margin of profit. Within the last year there have been alarums and excursions, in the geological world, faiths have been unsettled and judgments shaken and Cobalt has already benefited by the fresh outlook obtained to no mean extent. While the promoter and the broker serenaded Cobalt, and the public bought her stocks at many times par, the mining engineer packed his trunks for flight every time he lost values in his vein; to-day there is no longer a searching of hearts and a "firing" of men when a "face" that contained a dividend yesterday shows the worth of a few nickels to-day. The Cobalt engineer of 1912 is planning tennis courts as well as mills.

There is no reason at all why Gowganda should continue to be the Cinderella of the silver North. There are two mines there to-day, both of them privately owned and amply financed: it is most probable that if they had been exploited as the Bartlett was, they would be unproductive holes in the ground even as the Bartlett is to-day, and therein lies the secret of Gowganda's failure. If the Montreal River district is to make good it must be in the diabase; the Miller Lake-O'Brien is entirely in the diabase and at 250 feet shows more ore and better than at the hundred-foot level, and the Millerett has found no bottom to the ore in its eruptive rock yet. The Government spent $90,000 on a wagon road, over which it costs $30 a ton to haul ore. By the expenditure of another $27,000 on the road (not on the contractor), it will be possible to cut down the rate by a third and the operators who were lured out of the silver field to Porcupine will try their fortune once again in Gowganda.

Elk Lake will get its railroad, but it is to be feared that its treasures are to be found rather in the raising of the tall timothy and the pitted tuber than the production of precious metals.

South Lorrain is and always has been a one mine camp; but there is no reason why it should so remain.

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*Special Correspondent, Porcupine and Cobalt.

The probable zone of productiveness is narrow, extending along the contact between the diabase and the Keewatin. Until the Lewisohns, of New York, obtained control of the Wettlaufer mine statistics of progress were freely given and these were all favourable. The ore was high grade and in fairly continuous bodies. For the past year and a half there has been raised a wall of reticence, and as the Wettlaufer is the only mine where any effective mining has been attempted the South Lorrain camp has been almost unheard of and development has been at a standstill. There appears now to be another change of policy for monthly statements are promised. The only property that has had a chance has produced $222,000 in dividends and is on a 5 per cent. per quarter basis, with a million ounces reported as reserves. As to the future it is intimated that "another ore body has been discovered on the bottom level" and all mining men fortunate enough to penetrate beyond the reticence of the management are enthusiastic of the possibilities of the Wettlaufer. The Bellellen, after exhausting its first batch of high-grade ore, has found hope again in two shafts and half a dozen other properties discovered that smaltite veins on the surface quite frequently made good ore below before they exhausted insufficient treasuries and shut down until market conditions should be more propitious. It is reasonable to suppose that the revival in silver prospects that is surely coming will find South Lorrain a singularly opportune field. The Keeley, now under option to the Wettlaufer Lorrain Mining Company, the Bellellen, the Beaver Lake Mining Company and the Little Keeley are the more prominent prospects that have possibilities.

The future of Porcupine as the home of two large mines and half a dozen minor gold producers is almost assured. The Hollinger report placed companies in the favoured Pearl Lake zone on a firm and stable basis, and the magnitude of the Dome's preparations should instil a like confidence among those who have stock in or are financing any of these companies, who acknowledge the Dome as the sun in their heavens. When the Dome Mining Company threw up its option in the Cripple Creek country, it for the nonce wiped that section of the belt off the map as far as speculative interest was concerned; but so inadequate has been the exploration given to the outlying townships from McArthur on the south to Godfrey on the northwest, that the moss may be stripped from many a vein destined to make a mine yet. Shaw, for instance, contains claims that have so far amply rewarded the work undertaken and McArthur can show quartz with plenty of visible gold in it. There are disbelievers yet in the future of the camp among the learned; but there are to-day more real optimists among the techincal men in Porcupine to the square yard than there were to the square mile in Cobalt at the same stage of its development. Vulgarly speaking Porcupine has to produce or "bust" in the next twelve months; but there is very little expectation that there will be any explosion.

The prospective success of the Northern Ontario gold camp has warmed into life innumerable prospects and man-mangled mines all over the province. When the mills are running and the results are evident to the uninitiated, the gold fever is likely to be of a rather virulent type once more.

So far all profitable mining operations have been in the precious metals. Neither copper nor iron zinc nor lead has produced a dollar above expenses. Every fall and spring there are rumours of the discovery of a "mountain of iron" back in the bush somewhere; but there it remains despite the world's need of it. There is a deep-seated belief that sooner or later cinnabar will be discovered and confirmation is lent to this by the fact that quicksilver is undoubtedly present in some of the Cobalt ores. Unfortunately the mercury found on the gneiss boulder in the middle of the Groundhog River was placed there by the hand of man and not by Providence; but the Indian tales of the "medicine stone" found on the coastal plain of Hudson's Bay undoubtedly relate to cinnabar.

The many uses the laboratories of the world have discovered for nickel has induced a great stirring of interest in the Sudbury field, and, while the International Nickel Company will still control, it promises to have rivals. The importance of the Sudbury field is seldom realized; so rich is the ore that if an upheaval of nature were to close down the mines the navies of the world would have to suspend their programmes of construction until they were reopened or another field discovered.

There will soon be published by the Temiskaming & Northern Ontario Railway Commission a report compiled by their mining engineer, Mr. A. A. Cole, showing the consumption of farm and garden produce by the miners of Cobalt. In the deserts of Nevada and Australia the camps had perforce to import all their meats, all their vegetables for the men and fodder for the cattle in crates and in boxes and cans. Last year, directly above the La Rose vein, which has yielded millions in silver, a crop of potatoes was grown three to four hundred tons to the acre. In Casey Township the Casey Cobalt is set in the midst of a farming community, and not ten miles north of Cobalt is land that can and will produce all the food stuffs that the miners of the whole region will require. The average number of men last year employed at twelve Cobalt mines was 2021, and the average wage paid per man per year $869, so that the spending power of the miner is obvious. The miner has cash and will spend it generously for what he wants, the settler has farm produce, but not enough cash to afford one meat meal a day; the exchange is merely a matter of better intercourse and transportation. When the farming lands of Temiskaming are properly opened up every additional drill runner or mucker put on the staff of any mine in Northern Ontario should mean the widening of the market for Northern Ontario produce. The two industries exist side by side and should be mutually supporting. So the many minor scourges that exist among men depending entirely on canned foods would disappear and the settler would have an assured market.

Within ten years Northern Ontario should be able to exist irrespective of Eastern bases, the prospector blazing the road into the wilderness and pushing back the frontier, the miner digging from the rocks the specie to pay the settler, the colonist tilling the soil to feed them all. a great and mutually dependent trinity of pioneers.

MINERAL OCCURRENCES AND INVESTMENT OPPORTUNITIES

Written for the Canadian Mining Journal
by L. O. Armstrong.

[Editor's Note.—At the request of the Canadian Mining Journal, Mr. L. O. Armstrong, Colonization and Industrial Agent of the Canadian Pacific Railway Company, has given the following brief outline of the mineral occurrences along the line of the Canadian Pacific Railway. For some years the Colonization and Industrial Department of the Canadian Pacific Railway has been collecting specific data pertaining to these matters. This article, of course, is intended only as a superficial presentation. Any readers who are interested can obtain from Mr. Armstrong or from the Canadian Mining Journal much fuller details.]

* * * * *

It will no doubt interest your readers to have a cursory review of the outstanding opportunities for mining investment in those parts of Canada which the Canadian Pacific Railway serves, or which are directly tributary to this line.

Nova Scotia offers us probably the best and largest gypsum deposits in North America, also many other alluring prospects and mines. Selenite, lime rock, salt springs, and iron ore are found on the Windsor and Annapolis Railway near the towns of Scotch Village, Clarksville, Kennetcook, and Truro, in a well-timbered country with ample water powers. Near Clarksville is the famous West Gore antimony mine, the ore of which carries payable amounts of gold. The clays of the country would repay close examination. They furnish a first-class industrial opportunity.

In New Brunswick are very large bodies of high-grade gypsum, granite, marble, limestone, freestone, slate, mineral and salt springs, nickel, antimony, manganese, graphite and iron ore. Galena and copper have also been discovered and worked to some extent. St. John, New Brunswick, offers many inducements as an industrial centre. From Debec Junction come interesting reports of iron, copper and coal. St. Stephen, New Brunswick, asks for an iron foundry, and tells of undeveloped nickel deposits with valuable water powers.

Crossing the boundary into Quebec, we find very interesting alluvial gold deposits with occasional gold veins now being worked in the County of Megantic, on the Chaudiere River, which has a 500 h.p. waterfall available. Springhill, Quebec, reports gold; Scotstown, copper and gold, with a good opening for an economic plant. At Eastman, asbestos is found, also copper and iron.

The Quebec Central Railroad runs through one of the best mineralized portions of the Province of Quebec. Copper, asbestos, chrome ore, iron ore, limestones, and other economic minerals found here, make it a very attractive field. The rail and water connections are good, either from Quebec, Montreal, Portland, Boston, or New York. On the north shore of the St. Lawrence, east and west of Quebec, and in Eastern Ontario, are some of the largest titaniferous iron ore deposits in the world. The Province of Quebec has large and rich deposits of this ore, enough to supply the world for many centuries at the present rate of consumption. There are rich clays and limestones along the north shore of the St. Lawrence, between Quebec and Montreal. The oldest iron furnaces in Canada are at Radnor Forges, near Three Rivers.

The water power development is already very large, and there is more power to develop on the St. Maurice River. The development of the iron industry has barely begun.

There is natural gas on the north shore of the valley of the St. Lawrence. In the Laurentian Mountains between Quebec and Ottawa, is a vast untouched territory. The few prospectors that have worked there have found magnesite, graphite, and titaniferous iron ore. Large bodies of these minerals are well situated as to railway facilities, and there is water power to be had almost everywhere.

Graphite, magnesite, and mica are found between Labelle, north of Montreal, Grenville, and Ottawa. There are extensive and rich bodies of natural phosphate (apatite) in this section of the country. The phosphate and graphite are now being worked profitably. Half a million horse-power could be developed if necessary at several points in this district.

At East Templeton there is a body of feldspar of good quality. On the Gatineau River, north of Ottawa, are mica, phosphate, gold, marble, graphite and dolomite. There are splendid water powers in the Ottawa Valley from Ottawa to Waltham, and along the Canadian Pacific Railway from Ottawa to Port Arthur, and Fort William, Ontario.

No one need be reminded about the rich silver and gold deposits in the eastern part of the Province of Ontario, at Cobalt, Gowganda and Porcupine.

The enormous peat deposits of Quebec and Ontario are being developed and may become important industrial factors. The supplies of limestones, clay, and shale for cement making in the northeastern and northern portions of Ontario, and pretty much all through Southern Ontario, are almost inexhaustible. There are large deposits of "Leda Clay" at Carleton Place, near Ottawa. Renfrew has valuable limestone deposits which are being worked. This is a fine hardwood country, with abundant water powers. At every station you will find prospectors with claims to sell. The country is mineralized very generally; but investments have been made and development done in but few places. Southeast from Sudbury, between Sudbury and Toronto, there are numerous deposits of feldspar and other economic minerals.

Of the world's largest nickel deposits in the Sudbury region, much has already been written. No visitor from abroad should go through the country without stopping off long enough to see the nickel copper

* Colonization and Industrial Agent, Canadian Pacific Railway Company, Montreal, Que.

smelters and mines of the Canadian Copper Company. A large development is taking place at the junction of the Canadian Pacific and Canadian Northern, near Romford Junction, C.P.R. east of Sudbury, by the Mond Nickel Company.

On the Sault Ste. Marie branch, which runs from Sudbury to Sault Ste. Marie, Ontario, there are very promising gold finds and silver and copper discoveries at several points. The copper mines at Massey Station are well known. At Cutler both copper and nickel have been found. North of Blind River, Thessalon, Bruce Mines, and Desbarats, are large copper veins. At Desbarats, Ontario, and on St. Joseph Island nearby, are immense deposits of white silica sands, analysis of which show it to be suitable for the manufacture of glass, for moulding sand, and for high-class white concrete.

Nature has furnished Desbarats (Wilson Channel) with a natural dock with deep water, doing away with the necessity of dredging or construction. Good cement rock, clay, and shales are found here; but on the north shore of Lake Huron and Lake Superior they are generally very scarce. Sault Ste. Marie is now a progressive iron manufacturing centre, famous for its rail mills, with large developed water power and many other industries that are worth visiting. The future of the town as a manufacturing centre is assured. Extensive deposits of iron ore on the Algoma Central and on the Canadian Pacific Railway will form the future supply of the Sault Ste. Marie furnaces for years to come.

Coming back to Sudbury and following along the north shore of Lake Superior, we find iron, copper, zinc and platinum. In fact at nearly every station one can obtain news of promising mineral claims. At Schreiber, Pearl River, Rossport, Nepigon, and Hurkett, also at Loon, Beck and MacKenzie Stations, all in Ontario, magnetite and hematite deposits have been discovered.

Port Arthur and Fort William are in an old silver mining country, in which a new and growing interest is being displayed. New developments are under way at the present moment.

Of the coal deposits of Saskatchewan and Alberta, it is impossible here to write at length. Suffice it to say that large Canadian, American and European investments have been and are being made. The coal, silver, lead, copper, gold, zinc and iron deposits of British Columbia have been dealt with so frequently in these columns that I need not touch upon them specifically. It may be well to point out, however, that the opportunities in British Columbia are not confined to these commodities. There are many chances for sound investment in the quarrying of such economic minerals as marble and limestone. (Editor's note.—Our readers are here referred to a lettergram from the Nelson Boad of Trade, which will convey a very fair idea of the variety of mineral deposits that one small section of British Columbia offers.) On the coast the natural facilities for establishing large iron and steel works are unexcelled. Fuel, flux and ore can be obtained at tide water, shipped in vessels and assembled at a suitable manufacturing and distributing centre on tide water also.

TO THE INVESTOR

LETTERGRAM

GOLD MINING IN THE LAKE OF THE WOODS DISTRICT.

Letter from the Kenora Board of Trade. R. H. Moore, Secretary.

The Lake of the Woods District, embracing two or three hundred square miles of country, only a small fraction of which has been touched by the bona fide miner, presents to-day one of the best opportunities for investigation that lie before the mining investor. The lake itself is a body of water 120 miles long by an average width of 20 to 40 miles, dotted with numberless islands. Throughout the length and breadth of the district there occur great bodies of gold bearing ores. These are found from end to end of the lake shores with surface veins in some cases running from three to as much as 60 feet in width. Assays have shown that the gold contents range from a low figure to $100 per ton. This, of course, does not represent the general average of all the veins encountered; but values running in the neighbourhood of $100 have been encountered so frequently that it is a matter of no surprise when assays show that amount.

The opportunities for systematic investigation by the mining man have never been better than they are to-day. Certain companies that are operating mines on the lake east and west of Kenora, are at the present time going ahead with the erection of new buildings, and are pushing development work. More and more miners are being required every month. The results of actual mining have in most cases been splendid in the past, and should be even better in the future. Lack of adequate funds, poor management, law suits, and cheap stock companies have all combined in the past to achieve the disastrous results that culminated in the depression of 1897. But the lesson has been of value, and the immediate future should show that this district has tremendous possibilities.

The varied opportunities offering themselves in this district are impressive. In addition to the great gold bearing ore fields spread through the entire districts, there are prospects of copper, iron, mica, and other minerals spread everywhere throughout the country. One copper prospect is situated thirty odd miles from Kenora. Samples have been taken from this particular property that have given very high results. In the spring, this prospect on which considerable work has been already performed, will be diamond drilled, and much will be learned concerning its possibilities. East of the lake, and not more than 50 miles from the shores, there is a great wedge of iron ore, one of the largest bodies of its kind discovered. It is yet entirely unworked, although very favourable analyses have been reported. The water powers lying untouched and unoperated near this ore body, present an added induce-

ment to any responsible corporation. The occurrence of these iron ore bodies is not confined to this one locality. They are to be found north, south, and east. Lack of railroads through the district is the one great handicap at present. It has restrained legitimate enterprise to a very great extent. Except along the line of existing railways, the district has received no important attention. Since the opening up of the Canadian Northern to the south of the lake, and the building of the National Transcontinental to the north, mining interests have shown a steady improvement; and while no shouting has been done about our district and its possibilities, every day adds to the number of returns from the working mines hereabout. We are convinced that our prospects deserve and will receive the attention, not only of the Canadian and American investor, but also of the Transatlantic capitalist as well.

LETTERGRAM FROM THE NELSON (B.C.) BOARD OF TRADE.

Nelson, B.C., Feb. 19, 1912.

Canadian Mining Journal, Toronto, Ontario:

Capital that is available to be applied to deep mining has an almost unlimited field for profitable investment in the Kootenay district. Hundreds of prospects showing ore in the lowest workings, afford reasonable assurance of returns if taken scientifically and systematically in hand. The majority of the operating mines of Kootenay are handicapped by the necessity of paying their own way through the development stage, instead of being at liberty to develop at depth, and leave the profits to come later. In addition to these opportunities for judicious application of capital, numerous properties that are developed to the point of deep mining, but are at present in financial straits, are available for acquisition by large mining corporations. A large class of properties that are profitable only when handled on a large scale are those in which extensive ledges of low grade ore occur. For instance, the silver lead properties of the Ainsworth Mining Division, and similar low grade deposits in the Slocan District.

Execrable management was responsible in early days for the financial failure of many first class properties, some of which are now well known producers. The Queen Gold Mine of Sheep Creek, in twelve years has produced three-quarters of a million dollars, and the Standard Silver & Lead Mine at Silverton, last year opened a width of 83 feet of clear ore on the fifth level, thus justifying the faith of the capitalists interested.

The present rise in the price of metals enlarges the range of profitable operation, and the prospects for the coming year indicate substantial increase over the recent annual output which exceed seventeen million dollars. 87 properties shipped ore last year, and the output was thirteen million dollars. The decrease was due to difficulties in the fuel situation. The supply of coke is now assured, and the difficulties have been removed. In a fifteen year period the Kootenay and Boundary Districts produced 98% of Canada's lead for that time, 59% of Canada's copper, 37% of the silver, and 20% of the gold. The Kootenay zinc industry will be developed when a commercially successful process of reduction shall have been discovered. The first steps are now being taken to exploit the lode platinum. The iron and asbestos deposits are still virgin.

American and local capital is extensively invested in this magnificent field, which, strange to say, is consistently overlooked by English and Eastern Canada investors.

H. H. CURRIE,
Sec. Nelson Publicity Bureau.

LETTERGRAM FROM THE SHERBROOKE (QUEBEC) BOARD OF TRADE.

Sherbrooke, Quebec, Feb. 19, 1912.

Canadian Mining Journal, Toronto, Ontario.

Within a radius of 40 miles of the city of Sherbrooke, there are some 65 to 70 properties on which copper has been discovered, and upon which development work has been carried out. Some of these properties have been brought to the producing stage. They are all situated on or near one of the following four railways: The Grand Trunk, the Boston & Maine, the Canadian Pacific, or the Quebec Central. All of these railroads centre in Sherbrooke. These properties were first opened as far back as 1875. At that time the low price of copper and the high cost of freight and treatment, combined to make mining operations unprofitable.

In addition to these more or less developed properties, we have compiled a list of 220 prospects. It is the belief of well-informed people that a customs smelter and sulphuric acid works established here, would be the basis of a thoroughly safe investment.

Sherbrooke is the commercial centre of the asbestos districts, from which 90% of the world's demand for this mineral is supplied. There are still opportunities for safe investment in this branch of mining.

Important operations are now being carried on in the Chaudiere valley, by which it is expected that splendid results will be obtained from gold hydraulicking. Active work will commence in the early spring. These are only three of the more important branches of mining in our district.

The mineral wealth of the eastern townships is by no means limited to these three.

CHAS. E. BRADFORD,
Sec. Board of Trade.

LETTERGRAM FROM THE SYDNEY BOARD OF TRADE.

Sydney, N.S., Feb. 19, 1912.

Canadian Mining Journal, Toronto, Ontario:

(Editor's Note.—The following very brief lettergram indicates only in a rough way the field for mining investment in the district tributary to Sydney, N.S. Our readers will appreciate what it means to the investor to be able to secure workable coal deposits on or near tide water on the Atlantic. Of the other minerals mentioned, it may be said that the gypsum trade is susceptible of wide expansion on a sound industrial basis.)

Among the openings near Sydney for the mining investor, is the chance of securing 7½ miles of coal areas 3½ miles from Sydney. Prospecting is going on at present, and one seam of coal 4 feet thick has been discovered. A body of copper ore has been partly developed at Barachois. The property covers one square mile. The vein is 16 feet wide.

Several manganese, iron, and gypsum properties are owned in this vicinity, but no data are available.

Sydney Board of Trade.

EXTRACTS FROM REPORT ON THE BRULE LAKE COAL CLAIMS

Belonging to the North Alberta Coal Syndicate.

By James McEvoy.*

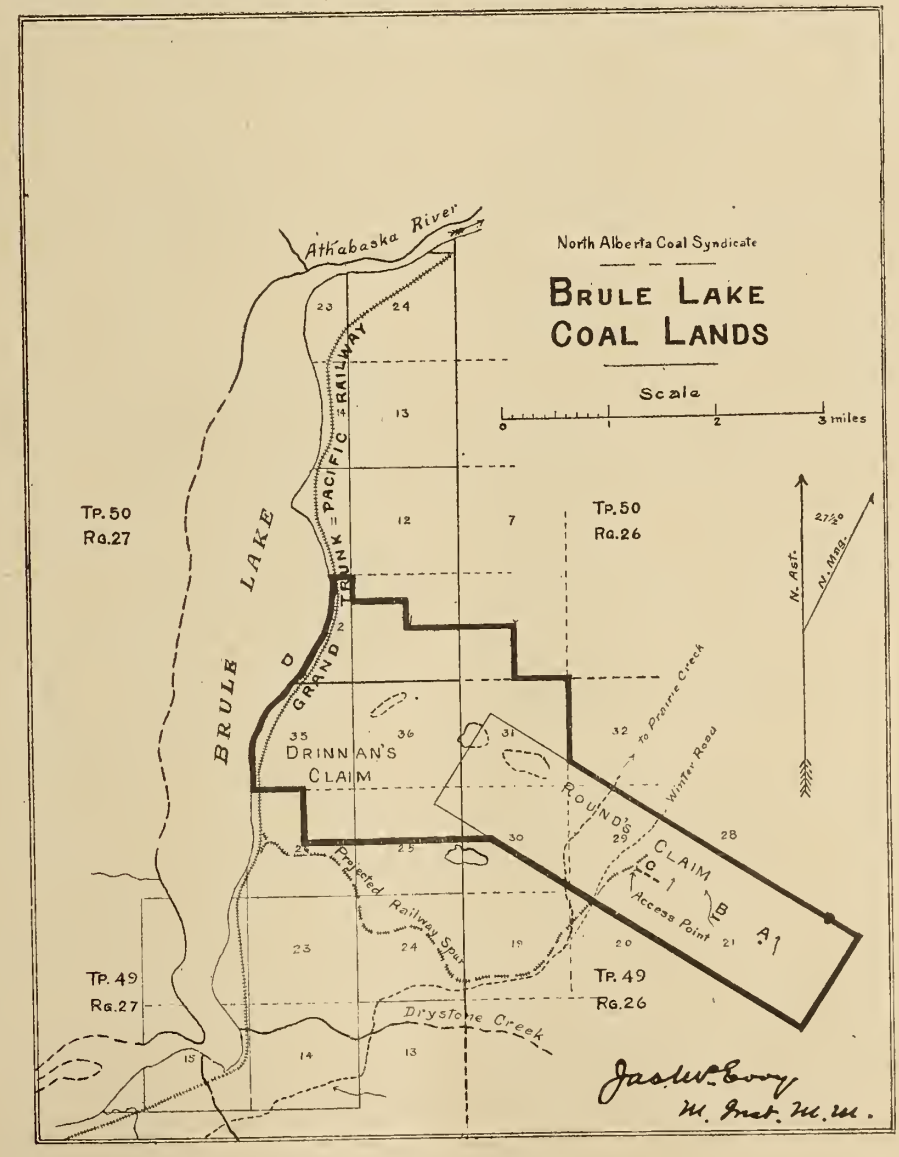
The Brule Lake Coal Claims herein referred to were discovered and staked in the interest of the North Alberta Coal Syndicate in July and August, 1910. They are situated as shown on the attached plan on the east side of Brule Lake, on the main line of the Grand Trunk Pacific Railway, and distant 197 miles westward from Edmonton. Two claims were staked, the Round claim containing 2,560 acres, and the Drinnan claim containing about 2,500 acres.

The combined length of the claims is 5¾ miles and their width from one mile to 2½ miles. Their greatest length runs with the direction of the strike of the coal, which is N. 57½ degrees W. astronomical.

It has been a matter of comment for years that no coal like the best of the Crow's Nest had ever been found directly on the line of the Grand Trunk Pacific. The reason that so many exploration and prospecting parties failed to discover it is now evident, as there were no natural exposures of the coal on the property, and the Kootanie Series of rocks which carry the high grade coals were only to be seen at one spot in the thick woods.

Geology.

The Kootanie Series of rocks referred to are the bottom beds of the Cretaceous formation and are the same horizon as the Crow's Nest coal-bearing measures. Where they come near the surface they are covered by a varying thickness of clay, sand, gravel and detritus. Their position shows them to be a part of the northeast side of the large anticline caused by Folding Mountain, and their dips to the southwest at angles of 65 degrees and over show that the measures are slightly overturned.



*Mining Engineer, Stair Building, Toronto

The underlying rocks of Jurassic Age are almost continuously exposed along the southwest side of the Round Claim for a length of 2½ miles. These are quite uniform and show no appearance of faults or breaks which is very strong evidence that the coal measures alongside will also be without disturbances.

Prospecting work uncovered a seam of coal at two points on the eastern part of the Round claim. The first or discovery point "A" being 1,130 feet and the second "B," being 580 feet above the best access point on this part of the property. These two openings show that the coal runs as expected parallel to the Jurassic rocks to the southwest. The seam is 10 feet thick, running with the length of the claim and dipping to the southwest at an angle of 65 degrees.

No section of the floor or roof rock could be seen, but where they were uncovered adjoining the coal they were both light grey shale approaching fine grained sandstone in composition. The walls were strong and even, ringing true under the hammer, and gave promise of light costs for timbering.

Quantity of Coal.

In the hill rising to a height of 1,200 feet from the point of access (C) and occupying all the eastern end of the Round claim, there are 3,200,000 tons of coal above drainage level. Eighty-five per cent, or say 2¾ million tons of this can be actually taken out, or in other words, 1,000 tons a working day for 9 years.

In a depth of 2,000 feet below drainage level on the Round claim only, there are over 16 million tons, of which, say 13½ million tons can be extracted, or 1,000 tons a working day for 45 years.

The total available coal within a depth of 2,000 feet in the Round claim alone is therefore 16¼ million tons, or 1,000 tons a day for 54 years.

In addition to this there are undoubtedly other seams on the property, at least there is no doubt in the writer's mind about it, as there is no reason for believing that in this particular spot the Kootanie series of rocks should carry only one seam of coal, when, wherever it has been completely examined, it carries 6 to 9 workable seams. The heavy covering of surface material prevented the opening up of other seams in the limited time available for prospecting work. Without further work it is impossible to make an estimate of the amount of coal contained in the other seams, but a very large tonnage may be reasonably expected.

No mention has been made of the quantity of coal on the Drinnan claim, as the surface covering there is very deep and the coal was not uncovered, although there is no doubt whatever that the seams also run through this part of the property.

Quality of Coal.

The coal when first reached was, as is usually the case, soft and disintegrated, but owing to the higher pitching attitude of the seam, this condition continued for a considerable depth. At the distance in, to which the test tunnel was driven, about 60 feet horizontally, with about 25 feet of cover at the face, the coal showed its true character for about 40 per cent. of its thickness, which was firm and well set and will yield a strong bright lump coal. The remainder of the seam was still affected by surface waters percolating through and depositing more or less earth or ash material.

The seam at the face of the tunnel was sampled in three parts, No. 1, No. 2, and No. 3, and the following are the assays as determined by the Milton Hersey Co., of Montreal:—

No. of Sample	Moisture	Vol. Comb Matter	Fixed Carbon	Ash	Sulphur	B.T.U.
No. 1...	0.16	21.46	69.46	8.92	0.65	13,679
No. 2...	0.16	19.20	67.90	12.74	0.44	13,247
No. 3...	0.09	19.99	69.87	10.05	0.38	13,726

The average of these by the proportional thickness represented by each sample is:—

Whole Seam	0.13	20.21	69.12	10.54	0.48	13,558

The colour of the ash was in each case grey.

The moisture is abnormally low, due, no doubt, to a dry condition of the atmosphere during transportation of the samples.

When greater depth is reached, the ash contents will no doubt be reduced.

These assays show the coal to be a very high grade bituminous one, but with sufficient volatile matter to make it free burning, and particularly well suited for locomotive and general steam use. It burns readily in the open with a bright orange flame.

According to American classification, this coal would come under the heading of semi-bituminous, which term is used for high grade bituminous coals. This term, however, is not in general use and would be, to some minds at least, misleading if applied to our Western coals.

Coking.

A sample of the coal was taken to Blairmore, and through the kindness of Mr. Coulthard, general manager of the West Canadian Collieries, was coked in the retort ovens at Lille. It yielded a bright coke of great strength and good porosity.

Another sample was coked in the beehive ovens of the Crow's Nest Pass Coal Co., at Fernie, B.C., and yielded a strong coke, but of somewhat darker colour, thus indicating that the coal is best adapted for quick coking in retort ovens. This is no detriment, for as far as new construction is concerned, the beehive oven may be said to be a thing of the past.

Point of Access.

The best point to commence mining operations is about the middle of the Round claim, where there is a very good natural site for a colliery yard, and plant This is the lowest available point on the property, except near the shore of Brule Lake, where, as stated before, none of the seams have been opened. As it may take considerable time to locate the seams at the latter point, on account of the heavy cover, and as it is advisable to get early into the market, the access point above given is considered the most desirable for the first point of attack. A railway spur nearly 5 miles in length will have to be built to take down the coal to the main line of the Grand Trunk Pacific. The route for this spur line was roughly located upon the ground and is shown on the plan. It will be easy to construct

and should not cost more than $15,000 a mile at the outside.

Method of Mining.

The development of the mine should be planned to keep pace with the demand for coal, but without ever forcing the mine beyond its reasonable capacity. As the demand will be small for the next twelve months, only a correspondingly small ontlay on plant is all that will be required for some time.

Two main entries, a haulage way with the return airway underneath, should be driven the full width of the seam, and working three shifts a day without interruption. The airway, being underneath, can be used as a drainage level in order to keep the main haulageway in a good dry condition. The coal obtained from this work will probably be sufficient for the first six months and by that time rooms, or rather chutes, can be driven up for an increased output. In all probability, the development work can be pushed ahead rapidly enough in the coal to the rise to meet all requirements up to 1,000 tons a day, but if not, a slope can be driven to open up another lift of coal below the main level.

The coal to the rise can be lowered directly to the main level by chutes. Whether these chutes are driven straight up the pitch or on slants is a matter of opinion amongst operators, with the weight of opinion somewhat in favour of the latter in high pitching seams.

In such a seam as this large mine cars can be used to advantage, as the haulage problem is of the most simple kind and the trouble of cars getting off the track can be reduced to a minimum.

Cost of Mining.

To attempt to give figures for the cost of mining is, within certain limits, only guess-work, but even considering the present known seam alone and not counting upon the other and larger seams which may be opened up and which may yield much cheaper coal, the cost will be moderate. Some of the reasons why the cost will be low are as follows:

(a) For some years, in all probability, no hoisting or pumping will be required.

(b) The haulage system will be very simple, being confined to the main entries and leading directly to the tipple.

(c) The seam is wide enough to allow all entries to be driven without rock-work, and consequently no rock or waste will have to be hauled out of the mine.

(d) With a return airway driven below the main entry, the haulageway will be kept dry, and this means a large saving in haulage costs.

(e) The mine is well adapted for using large cars and where conditions are favourable for such cars, the cost of handling is reduced.

Unless unforeseen difficulties are met with, and there is no evident reason to anticipate them, the labour cost may be expected not to exceed $1.25 per ton.

Markets.

Until the main line of the Grand Trunk Pacific is pushed farther westward and until the portion of the line now approaching the property is ballasted and settled so as to be in good condition for heavy freight traffic, the demand for coal at this point will not be large. It should, however, be a steadily increasing demand of from 50 tons a day to commence with, up to say 300 tons daily for local consumption at the end of the first twelve months. By that time the condition of the road will be favourable for heavy shipments to more distant points.

This would be a demand most suitable for a new colliery to keep up with and at the same time push its development ahead to get ready for its normal output.

There is no coal of equal quality within the same distance by rail from Edmonton, which is the centre of a network of railways. Additional lines to radiate from the same centre are projected. Notwithstanding the lang haul of over 400 miles, practically all the locomotive coal used at Edmonton comes from the Crow's Nest district.

The market for this coal, however, will by no means be limited at Edmonton, the advantage it has over other high grade coal at this point being emphasized to show its command of the market at a large central distributing point.

Crow's Nest coal wins its way in the market as far eastward as Brandon, and this Brule Lake coal will go to the same point, and perhaps a little farther to the City of Winnipeg itself, where at present practically all the coal used comes from Pennsylvania.

There is a rapidly growing demand for a coal of this grade throughout the prairie provinces for domestic use as well as for small and large steam plants.

Not only is this coal so well situated, geographically speaking, but being on the Grand Trunk Pacific, it will have the advantage of the cheaper haulage cost over the well-known low gradients of that road.

To the west, when the Grand Trunk Pacific is finished, a large market will be opened, not only for railway and domestic use, but also to supply the needs of smelters and furnaces in the copper and lead camps of the Telkwa Country.

As the coals of the Pacific Coast are sold at a high price, and as they are of a somewhat lower grade than the Brule Lake coal, the latter will have for its market all the territory to the west to within 100 or 150 miles of the coast.

The Canadian Northern Railway is projected to pass along the west side of Brule Lake and an easy connection can be made with that line, either to the east or west of the property by a short haul over the Grand Trunk Pacific. The Canadian Northern cannot afford to use on this part of its line, coal brought from the collieries to the southeast by a long roundabout haul via Edmonton. It will be forced in its own interest to use the good coal which is at the spot. The construction of the Canadian Northern will, therefore, create a market in the same way as will the Grand Trunk Pacific.

Taking all the factors into consideration, it would seem evident that in the near future there will be a large demand for coal, possibly within three years, up to 2,000 tons a day, and eventually double that amount.

Situated as this property is in such a commanding position, it will be able to get the best of the prices prevailing.

Summary.

(a) An exeellent high grade steam coal particularly well adapted for locomotives as well as for general steam use.

(b) A compact, well-selected area sufficient to cover the access points and to yield all the coal required for a period beyond which we do not need to look at present, but at the same time an area which is not unduly swelled by useless barren lands, upon which money would be wasted in rentals every year.

(c) A most desirable situation on the main line of the Grand Trunk Pacific Railway just at the edge of the mountains, with markets to both east and west.

(d) A high pitching seam with both good roof and floor, which experience in the mountains has shown will yield cheaper coal than the lower dipping or undulating seams.

(e) One seam already opened, 10 feet thick, wide enough to ensure freedom from that very objectionable item of cost, viz.: rock work.

(f) A reasonable, not to say confident, expectation of other seams being found.

(g) General conditions which permit an efficient plant to be installed at moderate cost.

I had the advice and able assistance of Mr. R. G. Drinnan in carrying out the season's work.

Respectfully submitted,

JAMES McEVOY.

Toronto, November 2nd, 1910.

—o—

BRULE LAKE COAL MINES.

Toronto, Ont., 29th November, 1911.

North Alberta Coal Syndicate, Toronto, Ont.:—

Dear Sirs,—I herewith submit a short account of the work done on the above property during the season just ended.

Starting from Edmonton on May 15th, 1911, with a party of miners, we reached the property at Brule Lake, Alberta, on May 17th, 1911, returning again to Edmonton on November 4th, 1911.

On arrival work was immediately commenced at the two access points on the property, marked "C" and "D" on the plan, with a view to locating coal seams and tracing them along the line of outcrop. From the letters that were forwarded to you monthly, reporting progress, you are no doubt familiar with the detail of the work done and it will not be necessary to go into this matter again at this time.

So far as the work at the point marked "D" on the plan went, nothing but negative information resulted. The surface covering of sand and boulder clay was so thick and so saturated with water that we were unable to penetrate it at any point with the facilities at our command.

Altogether, twelve test pits were put down in this vicinity, varying from twenty to eighty feet in depth, and in no case did we reach bed rock.

Early in the month of August I came to the conclusion, so far as this part of the property is concerned, that sufficient information had resulted to show that at no point easy of access to the railroad would it be possible to sink a shaft to reach the coal measures without going considerably below the level of the water in Brule Lake. The only alternative would be to drive a tunnel from a point near the railroad, and at an elevation of about forty feet above same, back to where the coal measures outcrop at that elevation; and then open up by means of a slope driven in the coal seam. This tunnel might be anywhere from one-half mile to one mile in length.

Under such conditions, even if the coal measures were found to exist here with a fair amount of regularity, I do not think that it would be a suitable place for an operation. Certainly the operating costs would be higher than at the access point marked "C" on plan. This would also be the case after adding a fair amount for handling the coal on the branch line necessary to enable operations to be established at this point.

The results from the work done at the other access point on the property, marked "C" on plan, were more encouraging. Four coal seams were located in this vicinity and traced for short distances along the line of outcrop. Two of the seams found are of workable thickness, being 4 feet and 14 feet respectively. Rough levels were taken to fix approximately the position of railroad yard and tipple, and at tipple level tunnels were driven in both the four and fourteen feet seams. An upper tunnel was also driven in the fourteen feet seam about sixty feet in elevation above the main tunnel.

On an aggregate 325 feet of tunnelling has been driven on the 14-foot seam and this has shown that the seam at this point is more or less irregular in thickness, varying from 9 feet to 28 feet. A crumpling of the measures, of only local extent, however, has caused this irregularity, but that it will disappear or at least be greatly modified when the tunnels are driven a few hundred feet further, I do not think there is any doubt.

The appearance of the coal in this seam, at points passed through in the tunnel where the seam was not abnormally thick, showed it to be a good firm coal, free from impurities; and rough tests made on the ground would justify the assumption that it is a high grade bituminous coal of coking quality and with all the properties necessary for a good steam fuel.

An analysis of an average sample of the seam taken from the face of the upper tunnel, gave the following results:

Moisture at 100 degrees C....	0.02 per cent.
Volatile hydro carbon.....	20.83 per cent.
Fixed carbon	66.35 per cent.
Ash.	12.80 per cent.
	100.
Sulphur	0.647 per cent.

The 4 feet seam contained a number of bands of shale mixed with the coal where it was first opened up. Although these bands were not continuous, and varied in number and thickness as the tunnel progressed, still at the end of 100 feet of tunnelling no great improvement in the nature of the seam had taken place. This tunnel is also in the disturbed zone and I have no doubt the thickness and quality will improve with further driving.

A considerable amount of work was done in an endeavour to locate the 10 feet seam (found last year), at the access point marked "C" on plan. This we were not successful in doing, as the point where it should outcrop is in wet ground and the water in the test pits prevented bed rock being reached. We traced this seam, however, from the point marked "B" on plan, about one-half mile down the hill along the line of outcrop, but from there to the point "C" the cover proved too heavy for work of this nature. Over the area on which the 10 feet seam was traced the measures were very regular and show that the disturbed zone at the point "C" does not extend that far.

After finding the 14 feet seam, and locating it at the access point "C," most of the work thereafter was confined to developing this seam to some extent, in order to find out what underground conditions were likely to be. So far as it went, this information was favourable to cheap underground operating costs. The seam lies at an inclination of 65 degrees from the horizontal, steep enough to allow the most economical methods of working to be adopted. The coal itself is easily mined without the use of explosives, and the rate to the miner should not exceed 55 cts. per ton. The haulage and maintenance costs will not be high and when an output of 500 tons per day is reached, the total cost should not exceed $1.50 per ton.

In estimating the amount of coal available for mining, on the property, I have confined my estimate to the 14 feet seam and to that portion of the property lying between point "C" and the eastern edge of the property, a distance of about 2 miles. In this area there is above water level about 3,500,000 tons of coal. Below water level to a depth of 2,000 feet, there is fully 10,000,000 tons of coal available. Taking the full amount estimate, viz.:—13,500,000 tons and assuming an average of 270 working days per year, there would be sufficient to maintain an output of 1,000 tons per day for 50 years from this seam alone.

As the property stands at present I would say that the work done has yielded sufficient information to justify the installation of a small plant for the operating of the 14 feet seam at the point marked "C" on plan. The question of the existence of a sufficient quantity of coal on the property, of the quality of the coal, and of the cost of production, has been, to my mind, satisfactorily established, and therefore the property is now in shape for development and operation.

In figuring on a probable market for the product of the mine, the strategic position of the property plays an important part. It is situated at the entrance to the Yellowhead Pass through the Rocky Mountains. Through this pass, to-day, two transcontinental railroads are being built. On both sides of the pass there is a vast territory, being opened up by these railroads, as yet only in the first stages of settlement and development. As all the railroads already built or likely to be built to serve this new territory must converge at this point to pass through the mountains, it places the property in direct communication with a very extensive market. No large area of coal lands containing this grade of coal is known to exist close enough to this new territory to rank as a competitor. The only competition, therefore, will come from other collieries opened up in the Jasper Park coal field. With such a large territory to serve, extending into Saskatchewan on the east and British Columbia on the west, a good market is practically assured for all the mines that could be opened in this coal field.

To connect the colliery, which would be located at the point "C," with the main line of the G.T.P. Railway, a branch of 5 miles in length will have to be constructed. This branch line, so far as I can judge, would not be a costly line to build, and the grade would not be excessive for this class of railway.

Yours faithfully,

ROBERT G. DRINNAN.

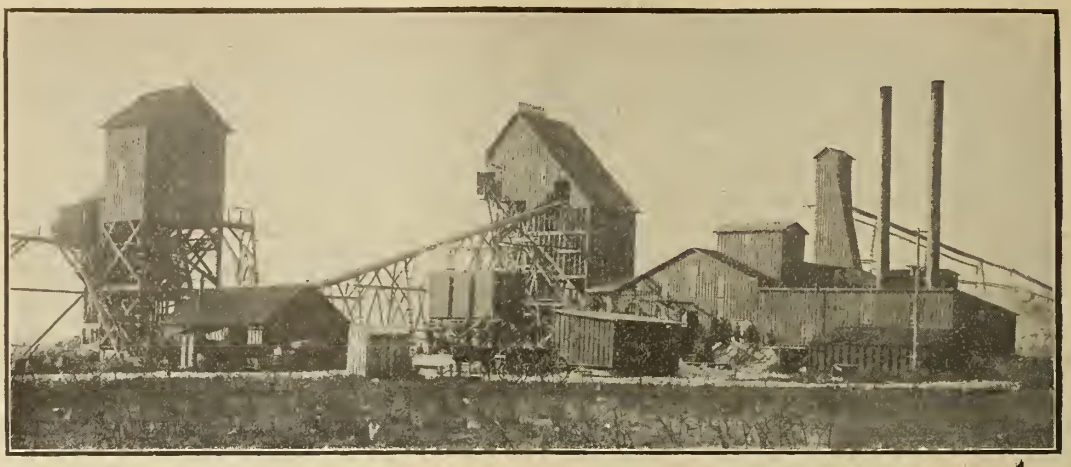
MINING AND MILLING IN THE JOPLIN DISTRICT

*Written for The Canadian Mining Journal, by J. J. McLellan, M.E., Webb City, Mo. Photographs by E. A. Collins, B. Sc., Mining Engineer, 104 Metcalfe St., Ottawa.

The mines in south-west Missouri, south-east Kansas and north-east Oklahoma, may be divided into three classes.

First, the soft ground mines, among which will be included those mines in which the ore, whether blende or galena, is contained in mud which fills the cavities and interstices between the boulders, usually flint, that go to make up the ore body. The ore frequently occurs in large masses, completely filling the spaces between the boulders and in some cases even completely surrounding them. The usual occurrence is in crystals varying in size from minute particles to large masses weighing several hundred pounds. These deposits vary in size from small "pockets" containing a few tons, to larger "bunches" extending over several acres, frequently interspersed with barren "ribs." The hardness of these deposits varies with the length of time the ground has been drained, from very soft, running ground, requiring careful timbering, even that "spiling" be driven ahead in roof and sides, while in other cases, by careful work, most of the ore can be removed without timbering, as it is possible to cut drifts from fifteen to twenty-five feet wide, that will stand long enough to mine out the deposit. Frequently these ore bodies are quite rich, and are very profitable despite their small extent, occasionally running as high as fifty per cent. blende and galena.

The second division will include harder deposits of disseminated ore, which are frequently adjacent to and occasionally underlie the soft ground deposits. From a financial standpoint, these are our most profitable mines, for while they do not average so rich as the softer deposits, they are frequently of considerable extent, sometimes covering more than an acre, and having a thickness of over one hundred feet. These depo-



Red Dog Mining Company Plant

sits vary in richness up to ten, and in rare cases as high as twenty-five per cent. of ore.

In the third division will be considered what are commonly known as "sheet-ground" deposits. These are the deepest deposits as yet worked at a profit, and in them the typical form is a horizontal or nearly horizontal stratum of ore-bearing flint from six to twenty-six feet in thickness, the average being between eight and ten feet. These deposits are usually found under mines, where the amount of capital invested need not be so great, though the cost of locating a profitable mine is quite likely to be very much greater.

Breaking the "Dirt."

Little need be said of this feature in soft ground, as it is largely a matter of using a pick with energy, and occasionally "spudding" some holes into the heading or stope to be shot with from one to two pounds of

Mill on Soft Ground Formation

a considerable thickness of limestone, and have limestone below them; they are the leanest as well as the deepest that are commercially available. As a rule they are unprofitable when ore (blende) recedes to a forty dollar basis, which is a fair price when spelter is 5.20 St. Louis. These deposits average quite large and in numerous cases have been mined out over areas exceeding forty acres in extent. During the years 1906, and preceding the panic in 1907, when the price for blende ranged from $45 to $50 basis, there was very large investment in sheet ground mines which were unprofitable during the period following the panic, when prices ranged between $34 and $40 per ton, only exceeding $40 for a few periods of short duration. On this account sheet ground mining has fallen into ill repute as an investment and recent developments in the district have been in the direction of soft ground dynamite. In some mines which are quite dry, it is profitable to use air drills and mine in much the same manner as in the disseminated deposits. In the disseminated ore bodies the top of the ore is mined out first and then the lower portion by successive understoping. When the whole ore body is mined from one level it is usual to carry a heading of seven or eight feet and then to carry successive stopes of from eight to ten feet each. It is common practice to mine only the upper part, say thirty feet, of the ore at one time and in case the ore body has greater depth, a second or third stope follows until the bottom of the deposit is reached. This custom is partly due to drainage difficulties, partly to the fact that most of the properties have quite limited capital for development, and must begin producing as soon as possible.

The pillars are left in thin ground as much as pos

sible and frequently are much too far apart for safety. Some of these mines have air drills, almost invariably 3 or 3¼ inch piston drills. Some of them still use hand drills, the men working in pairs. In some mines "snake holes" abound and are of considerable assistance. "Snake holes" are cracks or interstices among the boulders, either water courses or merely cracks that have not been entirely filled by deposition.

The sheet ground mines require air drills for their successful operation. Where the thickness of ore does not exceed twelve feet it is usual to work the whole face from a column. Each pair of "machine men" is expected to drill a round each day, a "round" is usually four holes, but in some cases where the equipment is first class and the rock not too hard, five holes are required for a day's work. The depth of hole is usually equal to the height of face and the average footage per drill is about forty feet. Where the height of face exceeds twelve feet the common practice is to carry a heading of seven or eight feet and carry the remainder of the ore as a stope. The stope holes are drilled from the floor of the mine and as flat as possible, the dip rarely exceeding ten degrees. One drill on a tripod will keep up stope for from six to ten drills in the heading.

The spacing of pillars depends upon the particular mine under consideration, as some mines require pillars every thirty feet, while others are safe with sixty foot spacing. The pillars are usually staggered so that there shall be no lanes in which the roof (usually a stratum of soft yellow flint about six inches thick, more or less firmly cemented to other similar layers or to the limestone above), can not fall over any great area, without a pillar to catch the "slab." These slabs are frequently posted when they are suspected of having pulled loose from the rock above.

Typical Mill With Incline Tramway

It is usual to use about fifty pounds of forty per cent. dynamite to the round, and a round will break from twenty to sixty tons, depending on the height of face. The holes are nearly always "squibbed" with from one to two pounds of powder to make a "pocket" at the end of the hole so as to confine the charge at the point of greatest efficiency. Stope holes are often squibbed more than once with successively larger loads, until the pocket will hold more than a hundred pounds; such a hole will break as much as two hundred tons of dirt.

Mucking and Tramming.

The mucking is done by hand labour, most often as piece work. The ore is loaded into cans or cars holding from ten to twelve and one-half cubic feet. The cans set on small cars, with eight inch wheels, which run on a track of eight or twelve pound rails, with from fourteen to sixteen inch gauge. The shoveller

General View of Webb City

Typical Mill on Sheet Ground

usually pushes his can to the shaft, but where the "run" exceeds two hundred and fifty feet, it is common practice to run to a lay-by from which point the cans are taken to the shaft by a "mule" either two or four-legged, this depending on the mine. The four-legged mules will haul from two to eight cans to the trip and bring back as many empties. When the

General View Showing Tailing Pile

height of face exceeds sixteen feet it is common practice to furnish boards to the shovellers, these boards are of two inch oak plank twelve inches wide by ten to twelve feet long. Where cars are used, they are either dumped into skips, in which case they are of about the same capacity as the cans, or are pushed onto self dumping cages and are much larger.

Underground runs are comparatively short, for when the distance from the shaft grows troublesome, it is common practice to sink a new shaft, equip it with hoister and storage hopper and connect it to the mill hopper with an inclined tramway. This practice is frequently economical, for the shafts are usually five by seven feet, less than two hundred feet deep and are sunk and timbered for from five to fifteen dollars a foot, depending on the nature of the ground. One important advantage is increased hoisting and storag capacity.

Hoisting.

The hoisting is usually done with small geared hoist The common type of hoist has an eight by eight, eight by seven, upright engine, geared to a twenty inc drum. The cable is usually five-eighths inch, thoug half-inch is occasionally used. The "tub-hookers" an

hoistermen have become quite expert and it is quite common to hoist six hundred cars, each containing a half ton of dirt, besides handling the men and the sharp and dull steel; for the blacksmith shop is almost invariably on top, in an eight hour shift and with a total pull of about two hundred and forty feet. The record for the district is over nine hundred cars with such a hoist.

Recently a hoist with two eight by fourteen vertical engines direct-connected to a twenty inch drum has been put out by a local firm, and with it the record has been raised to ten hundred and thirty-five cans for a total pull of three hundred feet, in an eight hour shift. With such a hoist the writer was able to attain an average of forty one hundred cans per week (six eight hour shifts to the week) for twenty-three consecutive weeks, besides handling men and steel.

Concentration.

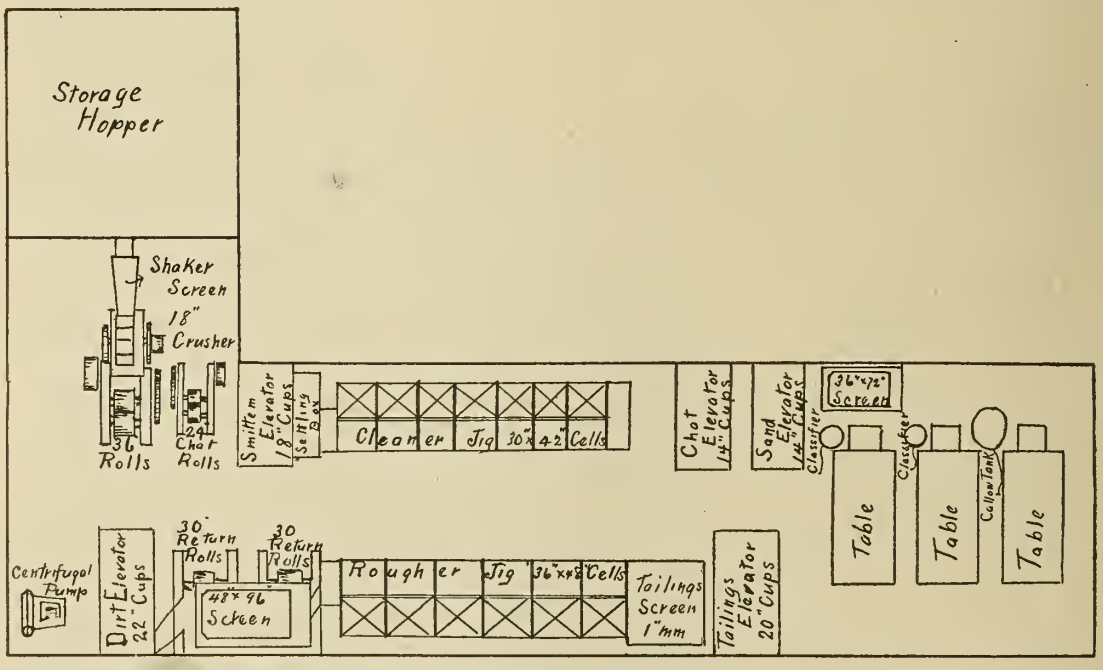
In discussing the concentrating mills we will consider only the larger plants typical of the sheet ground mines, as the other plants built for the short lived soft ground mines are comparatively small and incomplete. The dirt from the hoister is dumped upon a grizzly, usually made of steel rail with a flange planed to a width less than the ball of the rail. The separate bars are drilled at each end for a three-quarter inch rod and the bars are held apart by gas pipe washers. The ball of the rail is placed up and the bars are spaced from four to eight inches depending upon whether the drift breaks coarse or fine. The large boulders are culled, and those

An Example of Soft Ground or Pocket Formation

containing ore are broken by cull hands; one cull hand will ordinarily handle about three hundred cans in an eight hour shift. The storage hoppers which receive the dirt vary in size from one hundred to five hundred tons.

The dirt is fed by a crusher-feeder, who operates a gate by means of a rack and pinion. There is frequently a shaker screen, usually one inch mesh, which is suspended and shaken by an eccentric. The over size from the screen goes to a jaw crusher and is crushed to about two inches, thence to Cornish rolls and then to a dirt elevator which raises the product to a revolving screen usually one-half inch mesh. The oversize from the screen returns to other Cornish rolls and thence to the dirt elevator and to the screen again, while the undersize goes to the rougher jig.

The rougher jig is generally a six compartment affair, with thirty-four by forty-eight inch cells. The rougher discards from seventy-five to eighty per cent.



of the waste and gives an efficiency of about eighty per cent. and partial concentration of ores that carry less than five per cent. blende and galena; in richer ores the efficiency is much greater. The bed draw-offs are operated by the attendant jig-man, except the last two, which are commonly allowed to draw continuously. The product from these last two, along with other bed products not clean, and the hutch product from the last cell, go to the chat elevator. A chat is a piece of ore more or less firmly attached to or surrounded by the gangue. The chat elevator delivers its load to the chat rolls, for further grinding, and then it goes to the dirt elevator for another trip over the rougher.

The hutch product from the first five cells of the rougher is called smittem and goes to the smittem elevator and thence to a dewatering tank and to the cleaner jig. This jig usually has seven twenty-eight by forty-two inch cells. Where there is galena in the ore the first two compartments are used for it, the first to clean it and the next for the zinc-lead middlings, which latter are returned to the smittem elevator. Occasionally where the galena is in considerable quantity the first three cells are used, two to clean and the third for the contents exceed the lead. The jigman also attends to the regulation of the beds on the cleaner, the clean ore goes to the bin for concentrates, while the chats go to the chat elevator. The hutch product goes to the bin also, except that from the last cell which is usually returned to the smittem elevator for another trip over the cleaner.

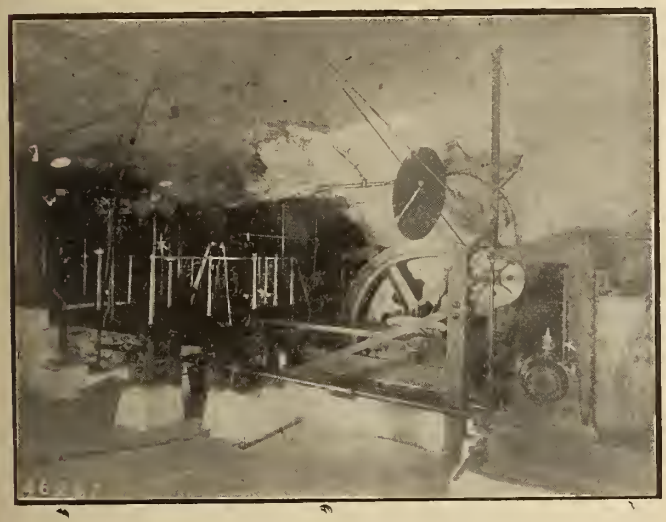
In a few of the mills the chats are put through a one-eighth inch screen and sent to a chat or sand jig, which may be used as either a rougher or a cleaner or even both, by cleaning on one or two cells of it, and roughing on the others. Where the ore is very chatty this is good practice.

The tailings from the rougher are partly dewatered, in the best practice screened of their fines, and sent to a tailing elevator. The fines from the rougher go to settling tanks or thickeners, from the thickeners to a sand elevator and thence to tables after screening out the product above one millimeter, which coarse stuff is usually sent to the chat elevator. All of the tailings from the cleaner are settled and undergo the same middlings, but this is not good practice where the zinc treatment as the fines from the rougher. The milling practice of the district can be greatly improved in its methods of treating its fines, there are very few slimers, and a comparatively smaller number of plants have adequate settling and classifying capacity; in fact, very few have sufficient table capacity to treat what fines they attempt to handle.

A floor plan of a typical three-hundred ton Missouri mill (three hundred tons in ten hours), along with some photographs of plants and workings are shown.

ELECTRIC POWER FOR UNDERGROUND WINDING AND HAULING ENGINES

Owing partly to the great depth at which mining operations are now carried out, and partly to the distribution of the mineral, winding and hauling engines have frequently to be installed underground. Such engines range from the small single drum haulage used for pulling tubs up an incline, to the large double drum winding engines used in South African gold mines when the ore is being worked at too great a depth for hoisting to the surface in one stage.



General View (Interior). New Heriot Gold Mining Company

In the early days of mining, hand winches were used for raising mineral in subsidiary underground shafts, whilst boys on ponies were, and in many cases still are, used to transport the material. In the majority of cases, however, the necessity of increased outputs led to the introduction of steam engines for haulage. This made it necessary for the steam raising plant to be installed underground, or the steam had to be taken down the main shaft from the plant at the surface. In both cases difficulties had to be overcome, for either the condensation losses were enormous, or else exceptional care had to be taken in the arrangement of the boiler flues, especially in the case of coal mines. In spite of these drawbacks, steam haulage has had a useful career, and even now is doing good work.

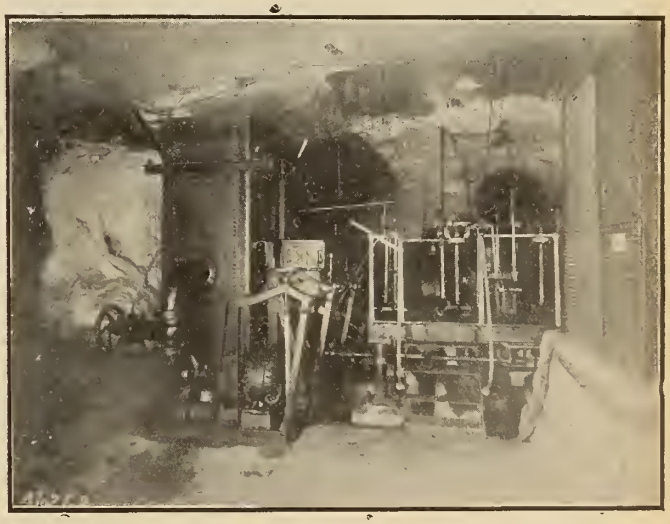
In deep mines, where steam could not readily be operated underground, compressed air was tried, with varying degrees of success. Certainly there were no condensation losses, as with steam, but other serious troubles had to be faced. The system was uneconomical unless pre-heaters and inter-heaters were used in conjunction with compound engines. Exhaust valves and ports would freeze, and altogether it has been found that, no matter how well designed or arranged, compressed air equipments are not ideal for underground winding or hauling engines.

During the time that the above mentioned developments were taking place, electric power was quietly making headway. Only a short time elapsed between its introduction as a source of motive power and its application to haulage. Some mistakes were made at first, totally unsuitable motors and control gear were used, but still the results were not entirely unsatisfactory, and steady progress has been made until to-day electricity is practically the only power to be seriously considered by the majority of users of underground work.

Steam and compressed air haulage are being ousted from their positions, there being many cases on record where engines of these types have been converted to the electric drive, or replaced by entirely new electric engines. Wherever new equipment is required, arrangements are usually made to install electrical apparatus.

Perhaps the greatest field for underground electric winders is among the gold mines of South Africa, for it is there that the greatest developments have taken place in deep level mining. The final depths to which the gold mines will be carried can scarcely be predicted. Even now mines exceeding 4,000 feet in vertical depth are preparing to extend their operation for an additional 5,000 feet. This of course entails winding in two or more stages since the limit of depth for one engine is in the neighbourhood of 8,000 feet.

Although not designed for such great depths, nor for an extremely great output, the underground electric



Controller and Driver's Platform. New Heriot Gold Mining Company

hoist at the New Heriot Gold Mining Co., Ltd., Denver, Transvaal, is very interesting. The service for which it was designed is:—

Depth of shaft, 1080 feet.
Incline, 45° to horizontal.
Weight of rock, 5,000 lbs.
Weight of skip, 3,000 lbs.
Weight of rope, 1,840 lbs.
Maximum speed, 2,000 feet per minute.

All parts of the hoist were designed to pass through an opening 7′ 8½″ x 3′ 6″, so as to permit it to be taken underground and along a drive some half a mile long. The approximate general arrangement of the hoist in its station underground is indicated in the view shown

in Negative 9125. From this it will be seen that the headgear and ore bins are cut out of solid rock. The mechanical parts of the hoist such as drums, bedplate, gears, etc., were supplied by Messrs. Robey & Company, Limited, through the British Westinghouse Electric & Manufacturing Company, Limited, who supplied the entire electrical equipment.

There are two winding drums, each 6 ft. in diameter and 3 ft. wide, arranged in tandem, but displaced sideways in relation to each other, so as to obtain a good lead from the sheaves. The drums are driven through single reduction double helical cut gears at a ratio of approximately 3:4:1, by means of a 500 B. h.p. (1250 h.p. maximum), 2,000 volt, 3-phase, 50-cycle, 375 r.p.m. slip ring induction motor, which is shown in Fig. 2 (B. 9124).

The speed and direction of rotation of the motor are governed by the liquid controller shown in Fig. 3 (B 9114). The controller is of the type usually supplied for winding engines, the resistance liquid being continually circulated over cooling coils by means of a small centrifugal pump, and the resistance in the rotor circuit varied by altering the depth of immersion of the iron electrodes connected to the slip rings. The reversal of the motor is carried out by two independent three-pole oil switches, either one of which can be closed at a given time, but not both at the same time.

500-h.p. Hoist Motor. New Heriot Gold Mining Company

Fig. 4 (B 9125) shows the driver's platform, and its arrangement in relation to the drums.

At the rear of the platform is the main switchboard, equipped with an overload release oil circuit breaker, with inverse time limit relay, and integrating watthour meter and an oil circuit-breaker for a small transformer, used to supply power at a low voltage to the small pump motor on the controller, and other auxiliary apparatus. The main oil circuit-breaker is arranged to be mechanically tripped from the emergency device seen in front of the driver's platform, in case that device should for any reason fail to act.

The emergency device is designed to drop heavy weights automatically across the foot brake levers in the event of over-winding, failure of power supply, or any other contingency necessitating sudden and powerful braking. A lever is provided on the platform so that the driver can operate this emergency device should it be necessary.

While the hoist described is representative of the best modern practice, it is but one of the many to be found in the South African Gold Fields, either in successful service or in course of erection. Among the largest are four recently ordered from the British Westinghouse Company for the Jupiter Gold Mining Co., Ltd. Each of these winders has two drums 10 feet 7 inches in diameter and 4 feet wide, designed to haul a rock load of 1,200 lbs. at 2,000 feet per minute, for 4,500 feet, up an incline of 38 degrees to the horizontal.

THE DEVELOPMENT OF FINE GRINDING IN CONNECTION WITH GOLD ORE TREATMENT

By Henry Hanson.*

Some years ago the stamp stood practically alone as a fine grinder where wet crushing was used, but of late years the tube mills and grinding pans have made great inroads upon the former work of the gravity stamp and to-day the stamp is being relegated to the position of a primary crusher.

In the old school the ore was reduced to a fineness where it would give up its gold to the quicksilver. The subsequent cyanide treatment of the plate tailings, if any, was largely confined to the sands, the slimes being avoided instead of sought.

The circumstances leading up to the first successful attempt at fine grinding on a large scale may be summarized as follows:

A telluride sulphide ore of an uncommon type, rich in gold, did not yield its values by the ordinary method of treatment. Smelting under the conditions obtaining at the time was economically unprofitable, as only the very high-grade ore could stand the cost. Experiments with a view of treating the bulk of the lower grade ores of the Kalgoorlie mines were carried on, first by roasting the whole product after crushing, secondly, by wet crushing and concentration, roasting of the concentrates, leaching of the sands and filter-pressing the slimes.

*Metallurgist, the Dome Mine, Porcupine, Ont. Paper read before the Porcupine Branch of the C.M.I.

The results obtained were in no way satisfactory.

At this juncture the London Hamburg Gold Recovery Company, Limited, had completed the Hannan Brown Hill mill, which was designed for the treatment of oxidized ores, being a dry crushing plant, followed by leaching the sands and filter-pressing the slimes.

Dr. Ludwig Diehl, who was the metallurgist for the London Hamburg Gold Recovery Company, Limited, and who made the Hannan Brown mill a success, was then induced to turn his attention to the treatment of telluride sulphide ores. After a series of experiments, Dr. Diehl determined that by grinding to a fineness not previously attained, the gold could be satisfactorily recovered from the raw ore. The problem then was to find or develop some machine that would satisfactorily and economically reduce the ore to the fineness required. Pans were tried, but did not give the product desired. The tube or pebble mill that was so extensively used by cement manufacturers, was adopted by Dr. Diehl as a fine grinder.

The first mill of this type was installed at the Hannan Star mine, Kalgoorlie, by Dr. Diehl. It was such a success that when the Hannan Brown Hill Company, controlled by the Bewick Moreing, reached the telluride sulphide zone, it was decided to erect a stamp mill with tube mills used as secondary grinders. Since then the tube mill as a fine grinder has found its way to all important gold and silver bearing ore deposits in the world.

Much may be said as to the further field for the tube mill. There are still possibilities of carrying on fine grinding to a greater point than is yet reached, but it is impossible to establish any arbitrary rule as to the point to which fine grinding may be carried on with an economical success.

The additional recovery obtainable by reducing the ore to a fine state of division varies greatly on different ores and on different grades of ores and it always becomes a question of whether the better percentage of extraction will compensate for the additional cost of reducing the ore to a slime and offset the possible higher treatment cost of a slime product. The relative initial cost of a sand and a slime treatment equipment and the expense entailed in making changes in plants already in commission must be considered. In fact it would require a careful weighing of the many phases of the problem by each mine before making a decision in the matter, but as cheaper power is coming into use and better facilities for handling the slime are offered by the various filters, I am more and more of the opinion that the field for the tube mill will be greatly broadened in the near future.

The tube mill is a simple and efficient machine with the operating details well worked out. It may, however, be possible to run two mills in tandem, each mill of suitable size and design for its particular class of work, the product of the first tube being delivered to a classifier where the fines are thrown out and the oversize fed to the second mill for further grinding. This scheme, so far as I know, has never been tried out where the tube mills were designed with a view of handling the two products. No data is therefore obtainable. Yet it would appear that such an arrangement would be much simpler than the introduction of different type machines such as rolls or Chilian mills between the stamps and tube mill.

The tube mill has been used very little where a product passing a 35-mesh screen was considered fine enough. Here the stamps have mastered the situation. It may not be economical to use the stamps and tube mills jointly to obtain a 35-mesh product, yet, with the present facility for fine-grinding, experiments along this line should prove valuable. In some instances, I believe it would be good economy to increase the stamp duty by using coarse screens and regrinding the resulting product in tube mills, even though this made it necessary to put some of the stamps out of commission. Whenever the stamp is followed by the tube mill more elasticity is obtained, for it is an easy matter to keep a plant in balance and obtain the desired product when a change in the screen practice at the stamps results in a corresponding change in the final product from the tube mill.

In other words, when the stamp and tube mill are used jointly it is easy to determine whether the complete sliming of an ore increases the net profits or not. On ore where complete sliming is not economical, it is quite possible that it is good practice to reduce the ore to a fineness which gives a greater percentage of slime than can be economically obtained in a single stage stamp reduction.

On the Rand, where stamps are followed by tube mills without "all-sliming," the standard of fineness has been brought up to 90-mesh, instead of 60-mesh as formerly, the additional recovery obtained fully justifying the increased cost of fine grinding. If it was economy to increase the fineness of the final mill product on the Rand where power is high as compared to mining districts where water power is available, it is reasonable to suppose that fine-grinding machines have still a field to cover.

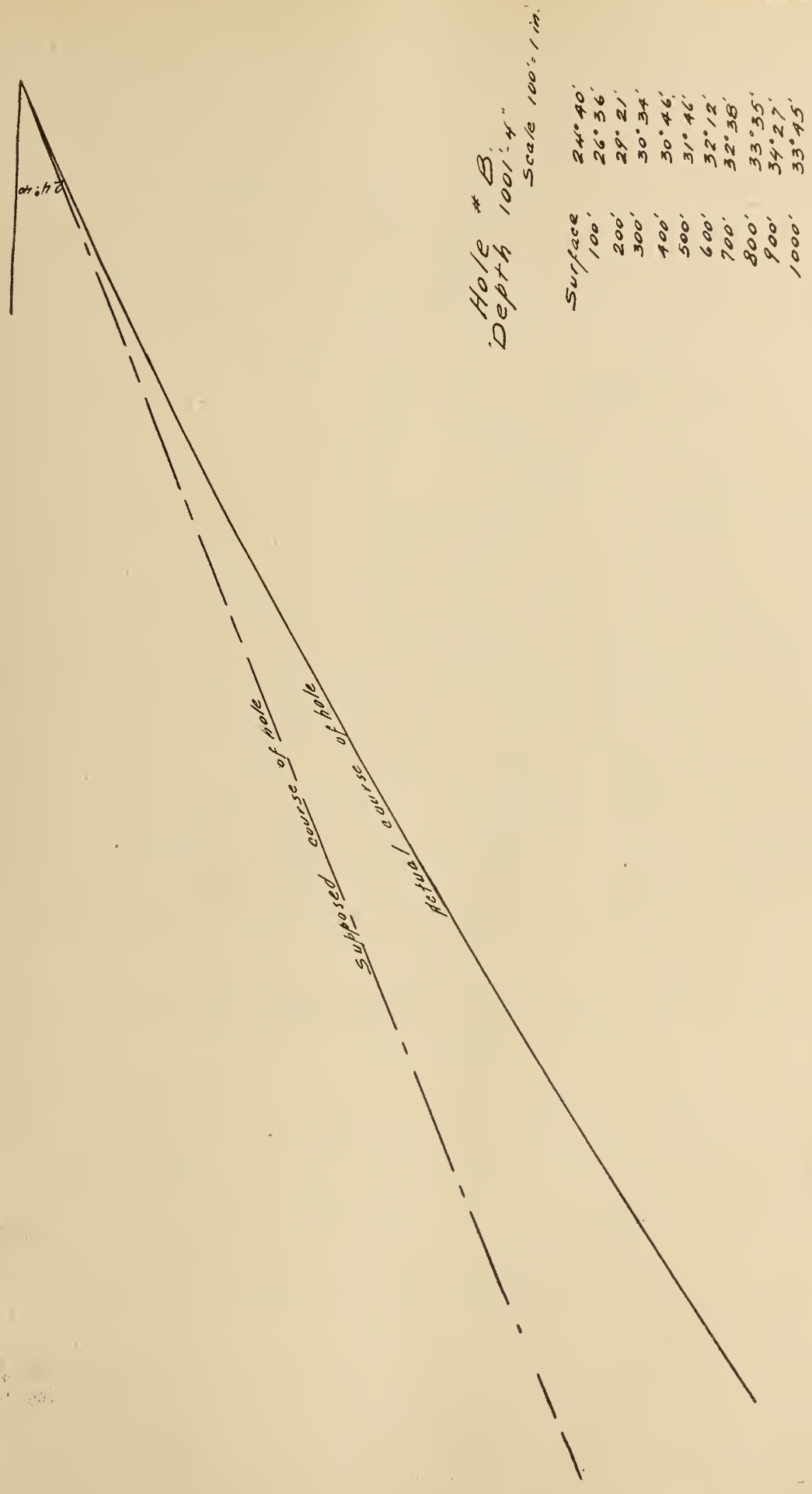
DETERMINING THE ANGLE OF DIAMOND DRILL HOLES

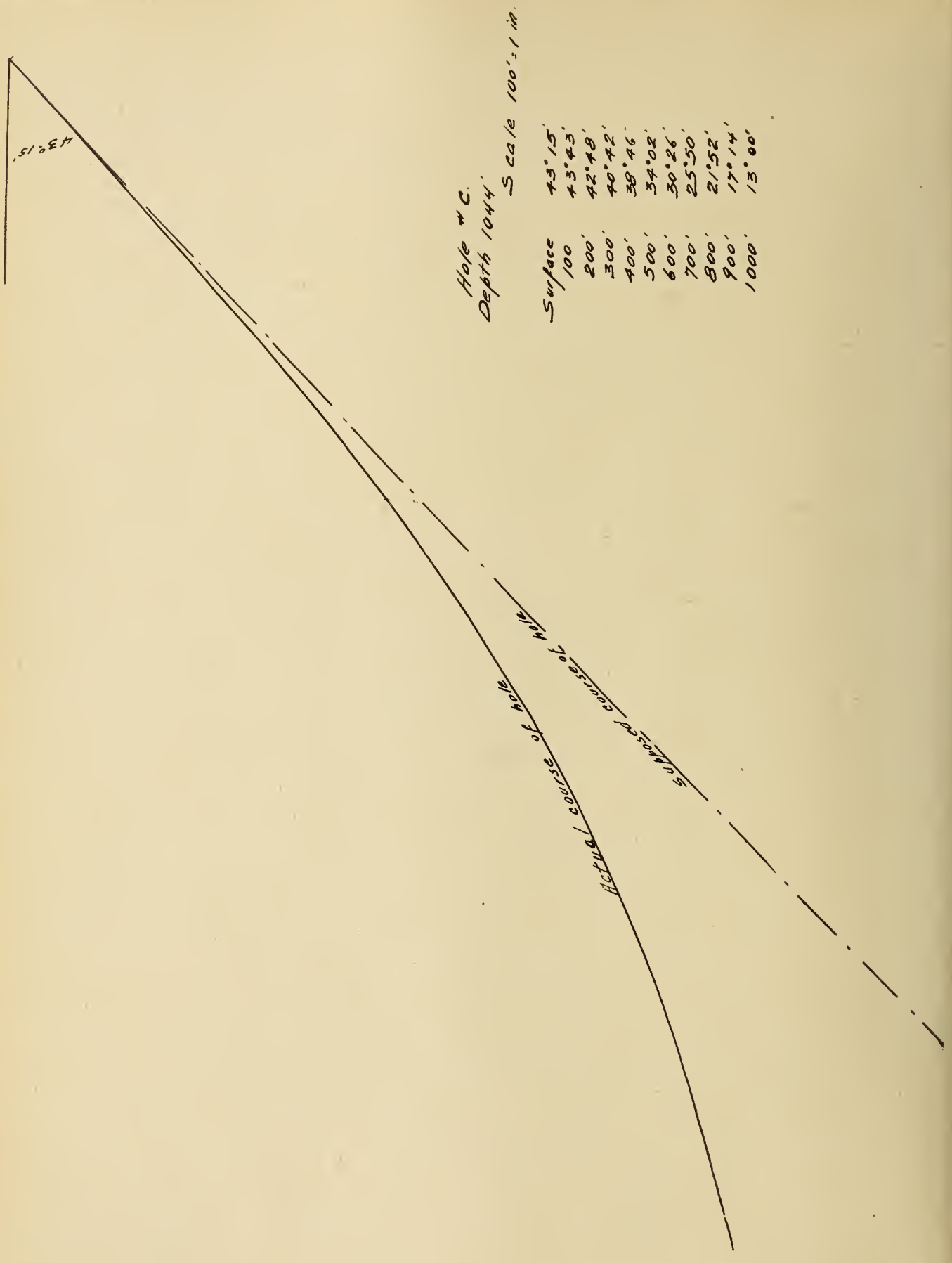
By G. C. Bateman.*

Diamond drilling in the Porcupine district has played an important part in the determination of the extent and character of the ore deposits, although on account of the irregular distribution of the gold, the results obtained must be considered as indicative, rather than conclusive evidence of the values that may be obtained with depth. In many parts of the world the surveying of diamond drill holes has been brought to an exact science, but as far as I am aware, little

* Mining Engineer, the Dome Mine, Porcupine, Ont. Paper read before the Porcupine Branch of the C.M.I.

Hole # 4
Depth 1191-10"
Scale 100'=1 in.
Surface 39°40'
100' 38°34'
200' 37°58'
300' 37°26'
400' 33°43'
500' 30°00'
600' 26°42'
700' 22°26'
800' 18°31'
900' 13°26'
1000' 10°30'
1100' 8°00'
1191-10" 6°53'
Natural course of hole
Supposed course of hole


Hole #8.
Depth 1001'-4"
Scale 100'=1 in.
Surface 24°40'
100' 26°36'
200' 29°21'
300' 30°34'
400' 30°46'
500' 31°46'
600' 32°12'
700' 32°38'
800' 33°35'
900' 34°27'
1000' 33°45'
Actual course of hole
Supposed course of hole


Hole # C.
Depth 1044'.
Scale 100' = 1 in.
Surface 43°15'
100' 43°43'
200' 42°48'
300' 40°42'
400' 38°46'
500' 34°02'
600' 30°26'
700' 25°50'
800' 21°52'
900' 17°14'
1000' 13°00'
43°15'
Supposed course of hole
Actual course of hole

attention has been paid to the matter in Porcupine. At the Dome mines it was desirable to obtain some idea as to the true angle of the hole, and as we were without apparatus of any kind, we were forced to evolve a method of our own, and, although the methods in use are rather crude, the results obtained are believed to be very nearly correct.

The important thing for us to find out was the deviation that the hole made from the angle at which it was started. The deviation in the other plane was not considered as on account of the drilling being at right angles to the strike of the formation, the hole would not be likely to run off much. In addition we had no apparatus at our disposal for surveying this.

For determining the dip of the hole, small bottles partly filled with hydrofluoric acid are used and readings are taken every 100 feet. The bottles are about 29-50 of an inch inside diameter and 2½ inches long. It is, of course, necessary that the sides of the bottle should be absolutely parallel to the sides of the drill rods. In order to insure this a 6-inch sleeve that screws on to the end of the core barrel was used. A piece of brass was turned down and fitted tightly into the sleeve, which was then put in the lathe and a hole turned in the brass centre, of a sufficient depth and diameter to hold the bottles and not allow for any movement. The brass receptacle is fitted with a water tight screw cap. This is essential, because if the brass container is not watertight the pressure of the water in the deeper parts of the holes will force in the cork and spoil the record. The bottom of the sleeve is fitted with another cap, which prevents anything touching the brass container. This was found to be necessary as caves frequently occur in the hole, and if the unprotected brass strikes these the bottle is apt to be broken.

A number of experiments were carried on before we determined the best strength of acid and the proper length of time for it to etch. It was finally found that one part of acid and one part of water gave the best strength, and that if this was allowed to etch for thirty minutes, a good ring was obtained. This length of time will do up to four or five hundred feet in depth, but as the time it takes to handle the rods increases the acid must be allowed to etch proportionately longer, as the wash of the acid in pulling up the rods, tends to obliterate the markings on the bottle. The pure acid is of very little use as it frosts the glass to such an extent that the marks on the bottle are unreliable.

An important point to be considered in this work is the correction for capilarity. If allowance is not made for this, the calculations will be of little use. This correction was found to vary from nothing to 6 degrees, depending on the angle of the dip, the greatest variation occurring where the angle is about 45 degrees. For vertical, or flat holes, there is, of course, no correction. In order to determine a standard factor to use for the different angles an arm protractor was set up in a horizontal position. On the arm, bottles, partly filled with acid, were placed, and different readings taken every five degrees, between 10 degrees and 80 degrees from the horizontal.

When the angle of the ring etched on the glass is obtained the results are platted, the different angles of dip being allowed for fifty feet on each side of the hundred foot mark, at which the readings are taken.

In order to survey the holes from which the drill has been pulled off, a stout reel equipped with 1,000 feet of ¼-inch cable is used. To the end of the cable a 10-foot core barrel is attached and the readings are taken the same as described above. This works very well between 90 degrees and 35 degrees, but is of no use for holes flatter than the latter angle.

By this very simple method several thousand feet of diamond drill holes have been surveyed and, as far as we have been able to ascertain, the results obtained very closely approximate the actual conditions. The variation of the holes from the angle at which they were started is usually very marked. In every case, so far, with one exception, the angle has become flatter. In one hole 1,400 feet in depth, the difference between the actual end of the hole, and the point where it was supposed to end has been as much as 600 feet, and in another case a hole which was started at 40-degree angle ran off until at a depth of 1,200 feet the angle was less than 7 degrees.

VEIN FORMATION IN COBALT

(Written for the Canadian Mining Journal by J. B. Tyrrell.)

At the Quebec meeting of the Canadian Mining Institute in March, 1911, Mr. C. W. Knight presented some sections showing the structure of the silver-bearing rocks in the Cobalt district.

In a discussion which followed the presentation of this address, Mr. J. B. Tyrrell spoke as follows:—

The light which Mr. Knight has thrown on the structure of the country in his interesting paper and in his geological sections will be of great assistance to anyone who is interested in the study of the origin and occurrence of the silver-bearing veins in the Cobalt camp.

I would like to emphasize what I said at the annual meeting of this Institute in Toronto in 1907* in the discussion of a paper by Dr. C. R. Van Hise on "The Ore Deposits of the Cobalt District, Ontario," and also in a paper which I wrote for the Canadian Mining Journal** in the same year. I then drew attention to the fact that the ore-bearing solutions would appear to have come up at the latest stage of the diabase intrusion, probably in the same vent through which the diabase itself had risen, and that they had spread out laterally beneath the relatively impervious diabase sill and had descended into the fissures which had been formed by the subsequent cooling of the rocks beneath the diabase. In this way the bottom plane of the diabase was the plane or zone from which the silver-bearing solutions had been immediately and finally derived, and consequently most of the veins in the district had

* Journal Can. Min. Inst., Vol. X., 1907, p. 58.

** Vein Formation at Cobalt, Ont., by J. B. Tyrrell, Can. Min. Jour., Aug. 1st, 1907, pp. 301-303.

been filled from above rather than from below, although this downward filling was part of the deep-seated and not of the vadose circulation. "The fissures would be widest and most extensive close to the diabase and would gradually pinch out, and disappear at a distance from (below) it. This distance must, of course, be computed from where the diabase was originally, before any of it was removed by erosion."

Beginning at the Western end of Mr. Knight's section we must recognize that this diabase sill certainly did not terminate where it terminates now, and that its western end was not the extreme end of the sill in that direction when it was formed, but that the sill must have covered a considerable stretch of the country to the west and that both it and the rocks which rested on it, if there were such rocks, have long since been eroded away. Following westward the rise of the bottom of the sill as it is known to occur beneath Peterson Lake we see that it must have rested on the hill occupied by the eastern portion of the Nipissing property, and that the rich veins on this property were therefore formed close to the base of the diabase, just as the silver-bearing veins beneath Peterson Lake are found to cling to the bottom of the diabase.

Where the Huronian conglomerates and schists immediately underlay the diabase sill they favoured the formation of the silver-bearing veins, but where the Huronian was not present and the Keewatin rocks immediately underlay the diabase the silver-bearing solutions descended into these rocks and formed veins in them.

A Member.—Might you not, then, reasonably expect to get silver in the Keewatin rocks of the vicinity of Sasaginaga Lake?

Mr. Tyrrell.—As you proceed farther and farther from where the diabase at present occurs you necessarily become more and more uncertain as to whether it flowed over that particular district or not, and, even if it flowed over or covered it and has now been eroded away, whether a considerable depth of the rocks which originally underlay it have not also been removed by erosive agencies. If, for instance, the diabase and two or three hundred feet of the rocks underlying it have been removed from a certain district it is quite possible that rich silver-bearing veins may have been present, and that they may have been entirely removed.

Near the eastern end of Mr. Knight's section we see that the diabase sill dips fairly steeply beneath the underlying Keewatin rocks. The Temiskaming mine is located in this part of the country and is underlain by the Keewatin, which is again underlain by the sill of diabase. In this case the silver-bearing solutions which gave rise to the mineral veins would seem to have proceeded upwards from the diabase rather than downwards from it. As a general rule I think that the bottom plane of the diabase was much the more likely zone or plane to carry enriching solutions, but in this case the enrichment would appear to have gone up from the top of the diabase.

In the Gowganda district most of the veins which carry silver are in the diabase itself and, unfortunately, we know very little about the character of the veins in the rocks immediately underlying it.

PERSONAL AND GENERAL.

Mr. Sydney Smith, of Cobalt and Porcupine, was in Toronto on professional business on February 20th.

Mr. Martin Nordegg has left for Western Canada. He will return to Toronto early in March.

Mr. Robert Bryce and Mrs. Bryce, formerly of Cobalt, are in Toronto for a short visit.

Major J. Edwards Leckie is soon to leave Cobalt to take up work in the West. Major Leckie's departure will leave a gap in Cobalt that can never be filled. He has made himself a popular institution, besides performing the multifarious functions of a good and active citizen.

Dr. W. G. Miller, Mr. J. M. Clark and Mr. W. F. Ferrier attended the recent meeting of the American Institute of Mining Engineers in New York.

Mr. R. B. Lamb has returned to Toronto.

Prof. William Nicol, of the Kingston School of Mines, spent the 18th and 19th of February in Toronto, arranging for additional equipment for the Mineralogical Department.

Mr. E. A. Collins has moved his headquarters from Ottawa to Kingston.

Mr. Ben Hughes was in Toronto recently. He will be one of the Porcupine delegates to the C. M. I. annual meeting.

Mr. P. Kirkegaard has returned to Toronto.

Mr. Walter Boyd, of the Geological Survey, visited Toronto on February 17th.

Dr. J. MacIntosh Bell, formerly director of the New Zealand Geological Survey, visited Toronto on February 21st. Dr. Bell, who has just returned from travelling through Turkestan, is again on his way to that country to make a series of geological examinations for London clients. In September next he will again visit Canada.

BRITISH NOTES ON CANADIAN COAL.

"Coal Age," a coal mining journal published in New York, recently printed an abstract of a report showing the world's production of coal, issued by the British Home Office Department, in which the following information concerning coal in Canada is given: The oldest coal fields in Canada which have been largely developed, are situated on the seaboards of the Atlantic and Pacific Oceans. On the Atlantic side of the continent, bituminous coal is being mined from thick seams of true Carboniferous age at the Sydney (Cape Breton), Pictou, Inverness, and Cumberland fields, in Nova Scotia. The coal of the Pacific Coast, generally bituminous, belongs to the Cretaceous age, and is derived from collieries at Nanaimo, Extension, and Comox, on Vancouver Island, British Columbia. The thick seams of bituminous coal, which exist in the vicinity of the Crow's Nest Pass, are now being worked on an extensive scale, and a large quantity of the coal mined is converted into coke for use in the smelting industry in British Columbia. All these coals are of Cretaceous age.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Dominion Coal Outputs.

The output of the Glace Bay mines for January was less than the previous January, but during February better weather conditions have prevailed, and at the 15th the outputs were 30,000 tons ahead of 1911. The output for February will probably be about 325,000 tons, which will bring the figures for the first two months of the year to about 600,000 tons, or 50,000 tons in excess of the 1911 figures.

The Springhill mines are doing very well, and the output on occasional days has gone over 1,700 tons. The output for February will probably reach 34,000 tons, making a total for the year of 72,000 tons. This figure is 52,000 tons in excess of 1911 outputs for the same period.

The total increase in the combined outputs of the Glace Bay and Springhill collieries will amount, therefore, to roughly 100,000 tons over January and February, 1911, a beginning which augurs well for the rest of this year.

The Dominion Coal Company has recently ordered ten Draeger apparatus, with the necessary oxygen pump, store cylinders and various accessories for its new rescue station, which is intended to serve the Lingan Collieries. These mines are situated about ten miles from the main station at No. 2 Colliery, and it has been considered advisable to have a substation within easy reach of the new mines. The company has also purchased two "Pulmotors," devices for automatically administering oxygen to injured or unconscious men. This device is a very clever mechanical contrivance which imitates the action of the human lungs in a manner which is almost uncanny. Dr. Professor Roth, of Lubeck, Germany, has made many experiments with this apparatus, and thus describes one experiment with a surgical subject: "On setting the Pulmotor in operation, the air bubbled up through the water; but a gentle pressure, with the finger, on the windpipe, caused the bubbles to cease immediately. At the same time the cavity of the chest and the diaphragm moved in an admirable manner, in fact, the quiet breathing of the cadaver was astonishing at first sight." To most laymen it certainly would be "astonishing," and the Professor's statement has the flavour of a very grim joke.

The Coal Company has also ordered ten apparatus with the various accessories for its Springhill collieries, and a rescue station will be erected there some time during the coming season. A "Pulmotor" will be purchased also for Springhill.

When the proposed extensions are carried out the Dominion Coal Company will have three rescue stations, equipped with fifty-five Draeger apparatus and four oxygen resuscitators. So far, the Coal Company has never had occasion to use its apparatus in its own collieries, but should the necessity ever arise, it is the intention that the equipment shall be adequate.

COMPANY NOTES

Kerr Lake directors have declared the regular quarterly dividend of 25 cents a share, payable March 15th. The company used to pay double this, but cut it in two the last year. A disbursement of 25 cents a share means $150,000. With the payment on March 15th, the company will have paid out 129 per cent. on its capitalization, as follows:

	P. C.	Amount.
1905	½	$ 15,000
1906	4½	135,000
1907	8	240,000
1908	15	450,000
1909	23	690,000
1910	40	1,200,000
1911	10	300,000
1911	10	300,000
1911	8	240,000
1911	5	150,000
1912	5	150,000
	129	$3,870,000

AMALGAMATED ASBESTOS.

The balance sheet of the Amalgamated Asbestos Corporation, as at 31st December, 1911, has been issued. It shows that profits for the year were $98,003.90, compared with $396,799.07 bond interest for year. The profits for the year were insufficient to meet operating charges, being $54,914.92 short of the sum required, so that with $396,799 bond interest not paid, the total deficit is $451,713.

The assets include $693,665, inventories, $172,689, accounts receivable, $47,927 and cash on hand, $19,887.

Liabilities include $87,452 accounts payable and pay-rolls, $328,840 bills payable, $233,333 bond interest accrued, $118,640 contingent account, and $17,248 reserve.

PLENARUM MINES.

Toronto, February 22.—The annual meeting of the Plenarum Mines, Limited, was held here yesterday in the office of the secretary, Alexander Fasken, a handful of shareholders attended and the meeting was purely formal. A brief report on the property containing little information was presented. The report was prepared by Mr. R. B. Watson. The old directors were re-elected. These are David Fasken, president; E. P. Earle, R. B. Watson, W. S. Edwards and Alexander Fasken.

AMALGAMATED RE-ORGANIZATION.

At a meeting of the bondholders of the Amalgamated Asbestos Corporation, Limited, held in Montreal, January 25th, 1912, this committee was appointed to submit a plan for the re-organization of the company.

The committee presents herewith a plan which will be submitted at the bondholders' meeting, February 29th, 1912, which presents their conclusions after an exhaustive examination of all available data and information, bearing upon the company and its affairs.

Your committee deem it unnecessary to go into the past history of the company further than to state that the result of the operations of this company since its organization lead to the conclusion that the original capitalization involving a fixed charge of $400,000 per year, was excessive.

It should also be stated that the results have been materially affected by difficulties in obtaining practical management and a general demoralization in the market for asbestos.

Your committee have had in mind the following features which they deem essential to a plan:

1. A fixed charge so low that under no circumstances would the company at any future time face a default.

2. Ample cash capital.

Given the present property vested in a company with a low fixed charge and ample cash capital, with the benefit of proper business management, whatever form of capitalization may be adopted, the holders of securities representing this capitalization will receive all possible benefits from the operation of such property.

The average annual earnings of the properties over a period of three and a half years, has been not less than $250,000. The plant is capable of an annual output of thirty thousand tons.

A conservative estimate of the profit which should be obtained would be $8 per ton, or a total of $240,000, per year. Under normal conditions with the business free from cut-throat competition, profits should exceed this amount.

However, your committee has deemed it unnecessary to consider the possible profits of the business, believing that if the company is put right, as to capitalization and management, the best results must come as a consequence thereof.

It is only fair to say that the conditions under which these properties have been operated during the past two years have been abnormal and the greater part of the time subject to unnatural conditions, which have reduced the profits below a reasonable basis. While during this time trade conditions both in the States and on the continent of Europe have been unfavourable, they now show signs of improvement.

The property in the hands of the reorganized company will constitute the most important factor in the business of producing the material for the asbestos trade.

The company is dealing in a product for which there is a legitimate and naturally increasing demand.

With the producing end of the business put upon a sound business basis, the raw material should command prices which would result in a satisfactory profit.

If re-organized on the basis of the plan herewith submitted the company will be in a position to withstand any periods of stress to which it may be subjected, as it will have in its treasury cash and quick assets, amounting to approximately $1,000,000.

The carrying out of the plan proposed must necessarily be accomplished through a foreclosure of the first mortgage on the property, which, however, will not necessarily involve any extended delay.

In recommending this plan to the bondholders, the committee do so with the assurance of its approval by a large percentage of the total bonds outstanding.

Respectfully submitted,

J. E. ALDRED,
Chairman.
U. H. McCARTER,
H. J. FULLER,
Committee.

February 16th, 1912.

Plan.

A new company to be formed under some suitable name to be decided upon, with the following capitalization:

First Mortgage, 30-year, Sinking Fund, 5 per cent. Bonds.—

Authorized issue	$5,000,000
Issued	2,875,000

6 per cent. Participating Preferred Stock—

Authorized issue	$4,000,000
Issued	4,000,000

Cammon Stock—

Authorized issue	$2,875,000
Issued	2,875,000

Note:—

Additional bonds to be issued only with the consent of two-thirds of the preferred stock.

After the preferred stock shall receive 6 per cent. dividends, and the common stock 5 per cent. dividends, any dividends paid shall be shared pro rata by the preferred and common stock.

Basis of exchange of old securities for new, and sale of new bonds to provide cash capital:

Holders of $8,000,000 old First Mortgage Bonds to receive in exchange $2,000,000; new First Mortgage, 30-year Sinking Fund, 5 per cent. Bonds: $4,000,000, new 6 per cent. Participating Preferred Stock; and $2,000,000, new Common Stock.

In other words, the holder of $1,000, par value old bonds will receive $250 new First Mortgage Bonds, $500 new 6 per cent. Preferred Stock, and $250 new Common Stock.

To provide cash working capital, it is proposed to sell $875,000 new First Mortgage 5 per cent. Bonds, these to be offered as follows:

To the old bondholders for subscription pro rata $500,000 bonds at 85 per cent. and accrued interest, with 100 per cent. bonus of new Common Stock, and to the old Preferred Stock holders for subscription pro rata $375,000 at 85 per cent. and accrued interest, with 100 per cent. bonus new Common Stock with the understanding that in case any or all of the bonds offered to the Preferred Stockholders are not subscribed for, unsubscribed bonds shall be at once reoffered to the old bondholders for subscription pro rata on the same terms.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

	Week Ending Feb. 17.	Year to date.
Beaver	59,801	59,801
Buffalo	60,939	297,585
Can. Gowganda	.....	15,967
Casey Cobalt	.....	500,000
Chambers-Ferland	.....	64,000
City of Cobalt	.....	132,673
Cobalt Lake	.....	75,080
Cobalt Townsite	59,000	252,700
Colonial	.....	40,000
Coniagas	.....	443,649
Drummond	180,000	300,000
Crown Reserve	.....	136,528
Hudson Bay	61,905	188,807
Kerr Lake	64,000	216,559
La Rose	229,804	793,531
McKinley	226,019	766,518
Millerette	.....	38,000
Miller Lake-O'Brien	41,500	96,500
Nipissing	125,076	507,221
O'Brien	64,097	257,990
Right of Way	.....	71,766
Temiskaming	.....	216,969
Trethewey	.....	84,563
Total	1,172,141	5,556,407

The total shipments for the year 1911 (unofficial) were 26,763 tons; for 1910 (official), 39,977 tons; in 1909, 30,09(tons; in 1908, 25,463 tons; in 1907, 14,000 tons; in 1906, 5,12(tons; in 1905, 3,144 tons, and in 1904, 153 tons.

COBALT ORE SHIPMENTS.

With a further shipment of 25 bars of bullion the Nipissing brought its total shipments for the week ending February 10 to a value of $97,766.77, this amount with the shipments made by the O'Brieu, the Crown Reserve and Campbell & Deyell bringing the bullion shipments of the week to the record figure of $122,781.92.

This is the largest amount of bullion ever to be shipped out of Cobalt iu one week, the high price of silver aiding in breaking the record for value although the weight of bullion shipped, 188,077.48 ounces also constitutes a record for quantity. The bullion shipments for the week are as follows:

	Ounces.	Value.
Nipissing	143,213.90	$97,766.77
O'Brien	19,570.00	11,253.23
Crown Reserve	15,000.00	9,720.00
Miscellaneous	7,293.58	4,081.92
Totals	188,077.48	122,781.92

The bullion shipments for the year to date are:—

Nipissing	$198,806.60	324,232.90
Crown Reserve	51,800.40	93,728.08
Temiskaming	13,459.96	24,924.00
O'Brien	18,886.32	32,292.09
Nova Scotia	21,500.00	31,710.00
Buffalo	4,900.00	9,000.00
McKinley-Darragh	1,390.37	2,528.00
Miscellaneous	3,802.00	6,670.94
Totals	$321,203.80	545,766.12

The ore shipments for the week amounted to a total of ten cars, six high and four low. Features of the week's shipments were the coming into the list of the Drummond with two cars of low-grade, the first ore to be sent out by the mine this year, and the shipping of two high-grade cars by Temiskaming. Chambers-Ferland is again absent this week from the list and so far this year has only seut out one car, as compared to an average last year of two cars shipped each month. The shipments for the week in pounds are:—

Nipissing, 2 l	144,920
Temiskaming, 2 h	133,212
Drummond, 2 l	120,650
McKinley, 2 h	120,452
O'Brien, 1 h	71,592
La Rose, 1 h	65,339
Kerr Lake, 1 h	41,056
Total	697,221

The shipments for the week and year to date in tons are:

	Week Feb. 10.	Total.
La Rose	32.67	291.86
Coniagas	35.78	221.92
O'Brien	35.78	96.93
Right of Way	.....	35.88
Chambers-Ferland	.....	32.00
McKinley-Darragh	60.22	268.53
Nipissing	72.46	191.11
Hudson Bay	31.42	62.95
Buffalo	28.12	57.31
Crown Reserve	22.45	68.25
Cobalt Townsite	65.29	88.79
City of Cobalt	66.33	66.33
Trethewey	42.28	42.28
Colonial	20.00	20.00
Kerr Lake	20.57	51.03
Cobalt Lake	37.54	37.54
Drummond	60.32	60.32
Temiskaming	66.60	66.60
Totals	348.61	1,759.72

BRITISH COLUMBIA ORE SHIPMENTS.

The feature of the ore shipments to the Consolidated smelter for the week ending February 17th, is the increase in the Standard tonnage, which has grown steadily. The Standard shipped over half as much last week as has been shipped from the mine during the rest of the year to date. The shipments from the Le Roi are also steadily increasiug, being 300 tons heavier last week than in the previous week.

Cousolidated's receipts and ore production:—

	Milled for week.	Milled to date	Shipments for week.	Shipments to date.
Rossland—				
Centre Star	....	.....	3,576	20,492
Le Roi	....	.....	1,259	6,152
Le Roi No. 2	300	2,100	326	2,835
Bluebird	....	.....	.....	33
East Kootenay—				
Sullivan	....	.....	280	825
St. Eugeue	....	2,100	.....	401
Ainsworth—				
Utica	....	.....	.....	132
No. 1	....	.....	66	170
Slocan—				
Standard	300	1,800	467	1,294
Van Roi	800	5,600	125	611
Hewitt	....	200	.....	25
Rambler-Cariboo	....	.....	36	222
Slocan Star	....	.....	.....	24
Richmond Eureka	....	.....	62	241
Noble Five	....	.....	.....	124
Whitewater	....	.....	.....	43
Ruth	....	.....	34	145
Ottawa	....	.....	.....	28
Eastmont	....	.....	.....	30
Fidelity	....	.....	.....	26
Apex	....	.....	.....	36
Daly	....	.....	.....	41
Nelson—				
Arlington	....	.....	86	470
Nugget	....	.....	.....	22
Granite-Poorman	250	1,750	.....	28
Queen	250	750	.....	70
Foreign—				
Knob Hill	....	.....	58	603
Hope	....	.....	.....	20
Northport	....	.....	.....	34
Totals	1,900	14,300	6,375	35,077
Granby Smelter Receipts—				
Granby	....	.....	23,068	148.939
B. C. Copper Company's Receipts—				
Mother Lode			7,400	52,637
Emma			639	4,029
Athelstan			....	227
Rawhide			346	3,118
Jackpot			301	2,483
Unnamed			....	227
Totals			8,686	62,721

SILVER PRICES.

	New York cents.	London pence.
Feb. 10	60⅜	27¾
" 12	Holiday	27 13/16
" 13	60⅝	27⅞
" 14	60	27⅝
" 15	59⅝	27 7/16
" 16	58⅛	26¾
" 17	58½	27
" 19	59⅛	27 5/16
" 20	59⅜	27 5/16

SHARE MARKET.

(Courtesy of A. E. Bryant & Co.)

New York Curb.

	Bid	Ask
Braden	...	...
B. C. Copper	3⅞	4
Butte Coal	22⅝	23
Davis-Daly	⅝	¾
Giroux	4 5/16	4 7/16
Greene-Cananea	7¾	8
Inspiration	18¼	18⅜
Yukon Gold	3⅜	3½
Goldfields Cons.	....	....
Nevada Hills	2¼	2⅜
Miami	....	....
Granby	....	....
Ray Central	2	....
Chino	....	....
United Copper	1¼	1¾
Tenopah Mining	7	7¼

Cobalt Stocks.

	Sales. Low		High
Bailey	.01⅞		.02
Beaver Consolidated	.47¼		.47½
Buffalo	.....	Asked	1.35
Chambers-Ferland	.12¼		.....
City of Cobalt	.10		.10¼
Cobalt Lake	.28		.28½
Coniagas	6.80	Bid	.....
Crown Reserve	3.03	Bid	.....
Great Northern	.09¼		.....
Gould	.02¾	Bid	.....
Gifford	.....	Asked	.03
Green-Meehan	.01⅜		.....
Hargraves	.07		.....
Kerr Lake	3.00		.....
La Rose	3.86		.....
McKinley-Darragh	1.81		.....
Nipissing	7.40		.....
Nova Scotia	....	Asked	.05
Ophir	.07		.....
Otisse	.00¾		.....
Peterson Lake	.07¼		.....
Rochester	.02½	Bid	.....
Right of Way	.07		.07¾
Silver Leaf	.03¼		.....
Temiskaming	.36		.36¼
Trethewey	.52		.62
Wettlaufer	.77		.78

Porcupine Stocks.

	Sales. Low		High
Apex	.07	Bid	.....
Dobie	.60		.....
Crown Charter	.16½		.17
Dome Extension	.42		.43½
Eldorado	.....	Asked	.08½
Foley-O'Brien	.32	Bid	.....
Hollinger	10.90		.....
Jupiter	.44	Bid	.....
Moneta	.....	Asked	.19
N. Ont. Exp.	.....	Asked	4.50
Pearl Lake	.20½		.....
Porcupine Central	3.62½		3.70
Porcupine Imperial	.05		.05¼
Porcupine Northern	.94		.97
Porcupine Tisdale	.03		.03½
Porcupine Southern	1.12½		1.15
Preston East Dome	.06		.06¼
Rea	1.06	Bid	.....
Standard	.21		.....
Swastika	.23		.23½
Vipond	.44	Bid	.....
United	.02¾		.....
West Dome	.40		.....

Sundry.

Island Smelters	.09		.09⅛
Canadian Marconi	.....	Asked	.04

TORONTO MARKETS.

Feb. 22 (Quotations from Canada Metal Co., Toronto).

Spelter, 6.50 cents per lb.
Lead, 4.25 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.75 cents per lb.
Electrolytic, 14.75 cents per lb.
Ingot brass, 7 to 12 cents per lb.

Feb. 22.—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Feb. 20.—Connellsville Coke (f.o.b. ovens).

Furnace Coke, prompt, $1.80 to $1.90 per ton.
Foundry Coke, prompt, $2.20 to $2.35 per ton.

Feb. 20.—Tin, straits, 42.90 cents.
Copper, Prime Lake, 14.45 cents.
Electrolytic copper, 14.37½ cents.
Copper wire, 15.25 cents.
Lead, 4.00 to 4.10 cents.
Spelter, 6.77½ cents.
Sheet zinc (f.o.b. smelter), 8.25 cents.
Antimony, Cookson's, 7.25 cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
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Quicksilver, $46.00 per 75-lb. flask.

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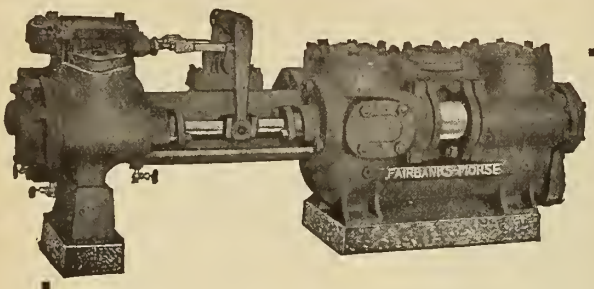

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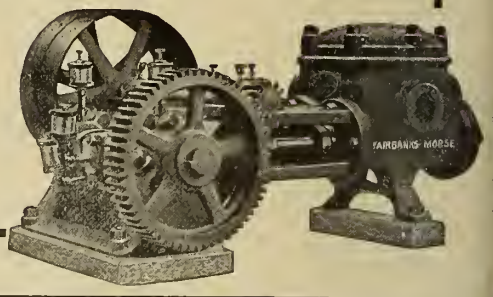

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WOOLSEY, W. J.
Mining Engineer
℅ Canadian Trade Commissioner
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Aggregate Value of $374,197,650

In 1910 the quantity of Ore mined was 2,216,428 tons, and of coal 3,139,235 long tons. The value of Minerals produced that year was: Placer Gold, $540,000; Lode Gold, $5,533,386; Silver, $1,245,016; Lead, $1,386,350; Copper, $4,871,512; Coal and Coke, $11,108,335; Other Minerals, $1,692,473, making the

Total Value for 1910, $26,377,066

Lode-mining has only been in progress for about eighteen years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

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MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

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In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

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For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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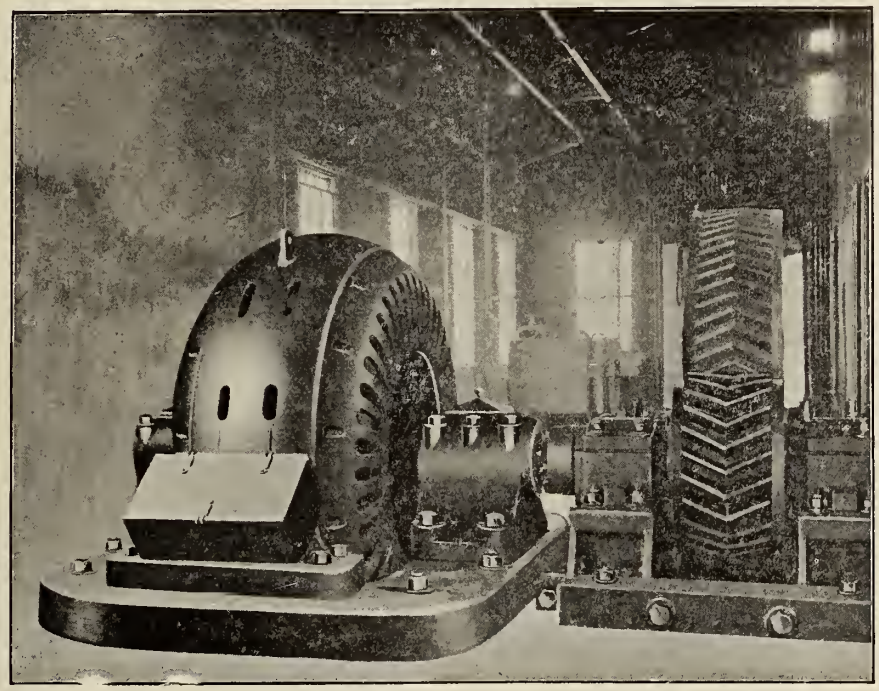

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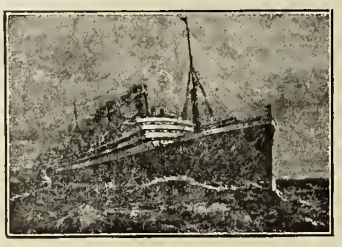

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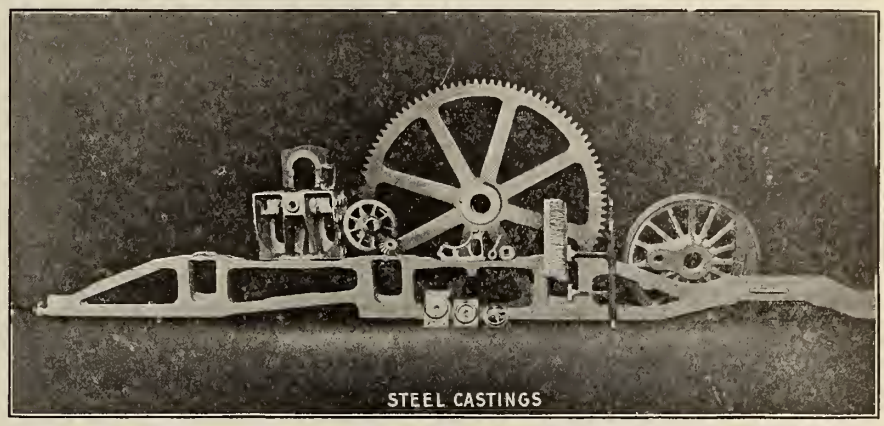

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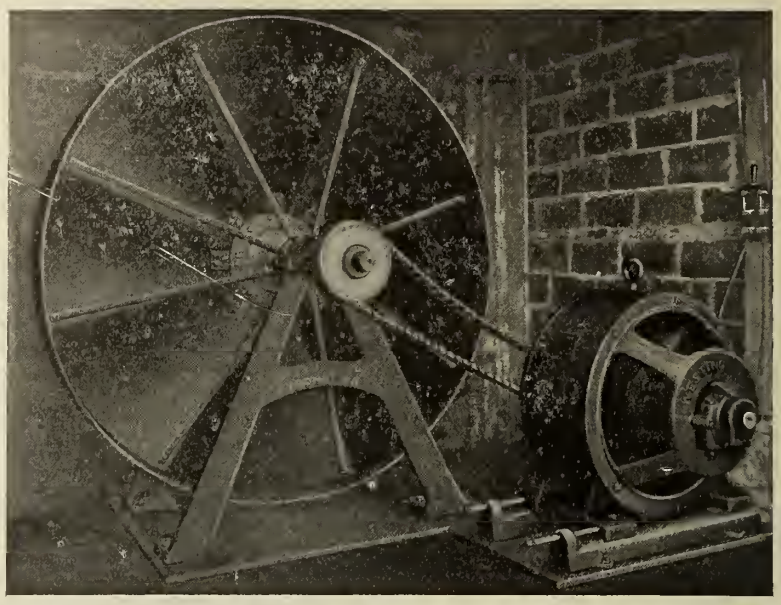

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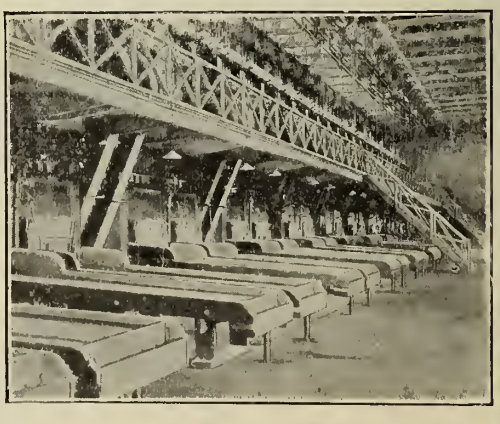

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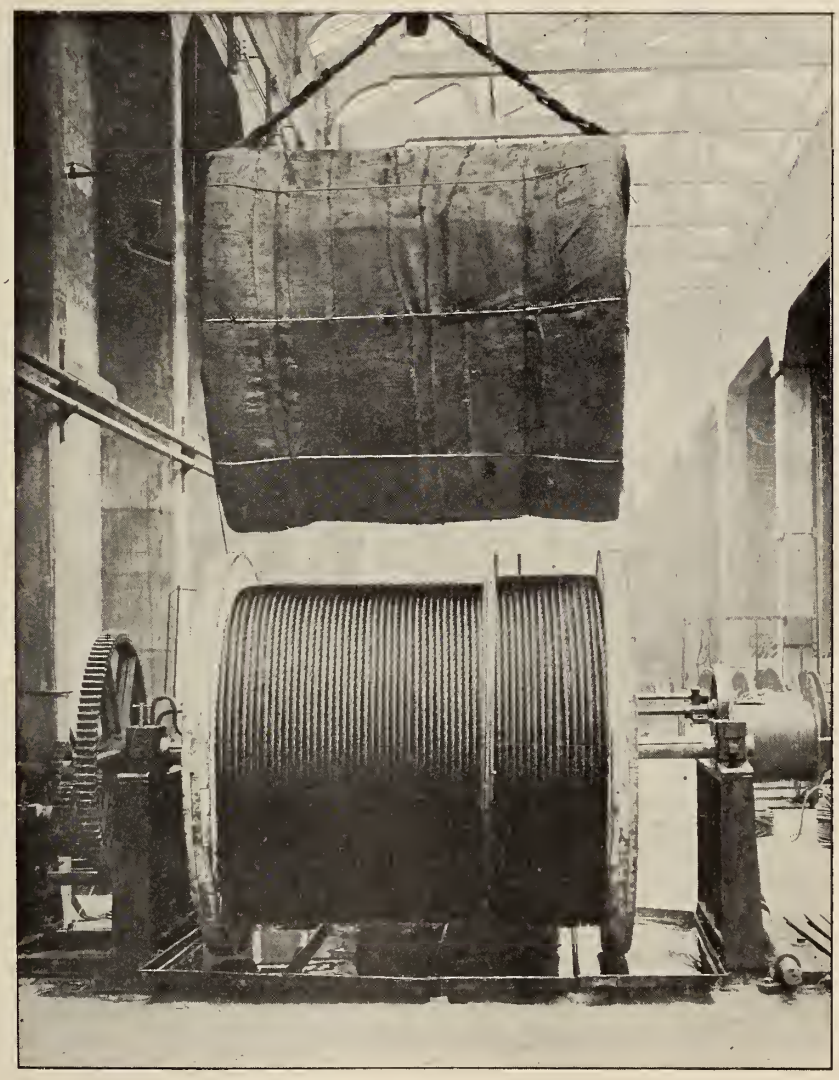

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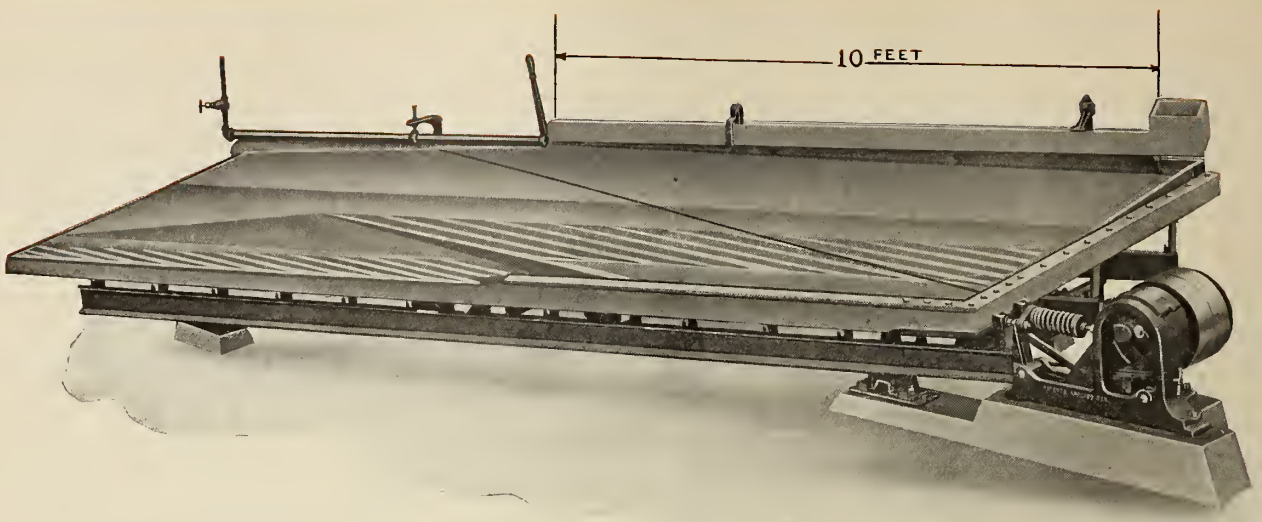

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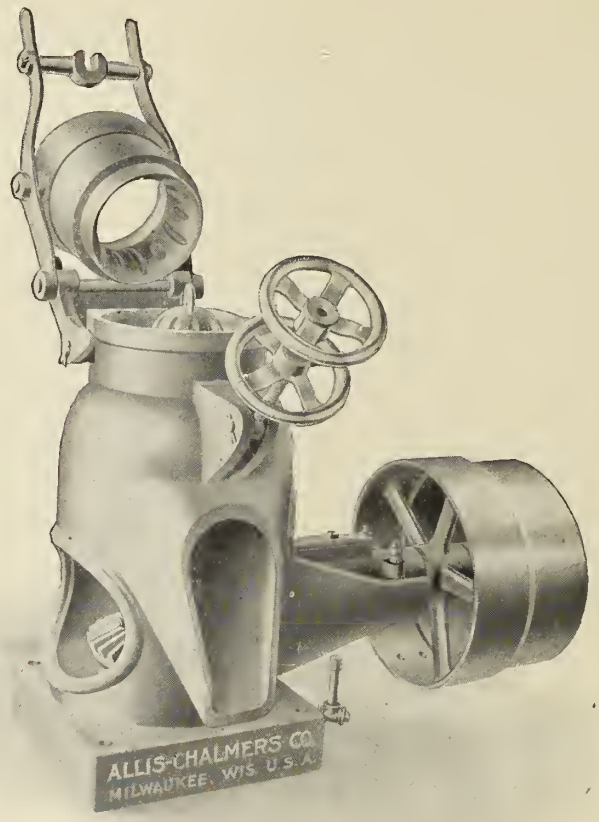

Style "B" Sample Grinder with Hopper Open

(Patented)

To vary the size of the product or to compensate for wear of the grinding surfaces, the practice heretofore has been to make the adjustment by raising or lowering the grinding head. In the Style "B" machine the adjustment is made by raising or lowering the hopper which carries the liner; this is accomplished by means of the hand wheels shown in the illustrations.

The cut shows the Style "B" Sample Grinder with the hopper thrown back. While in this position the hopper is self-supporting and an inspection of the wearing surfaces can thus be easily made.

This machine is fitted with tight and loose pulleys, 16 x 4½ inches, and should run at 250 revolutions per minute.

The machine occupies but little space, is constructed wholly of iron and steel, has the most perfect oiling devices, and is withal unsurpassed by any sample grinder on the market. For further information see leaflet No. 2036.

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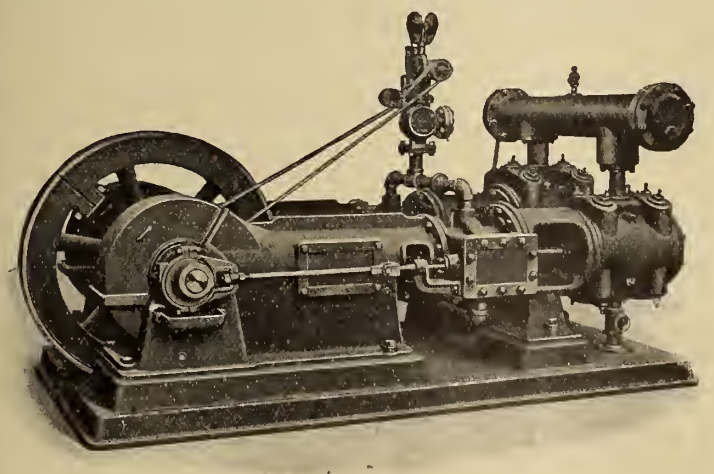

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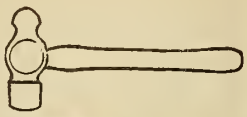
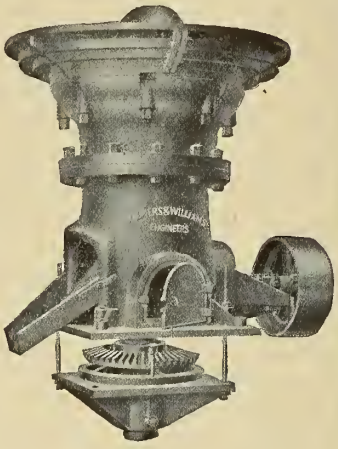


IN HERE

In Your Crusher

and have it



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IN shaft sinking a "BC-26" tool recently drilled 6-foot holes in twenty-two minutes each. This was done in Porphyritic Schist rock. The same tool is drilling 4-foot holes in this rock in eleven minutes. With the hand tools there is no time lost in changing holes as there is no setting up.

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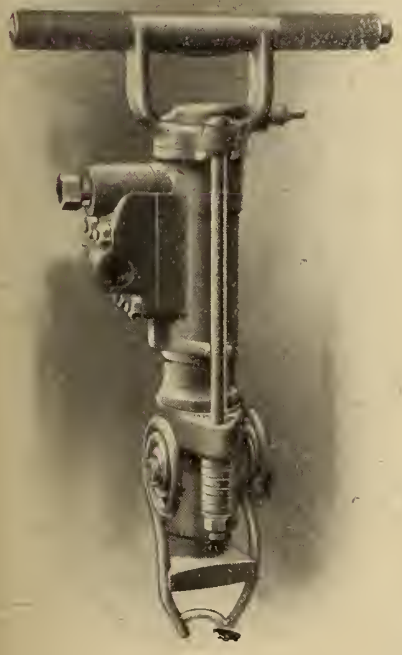

"B C R-43" Hammer Drill, with Automatic Rotation of Steel, for use with steam or air.

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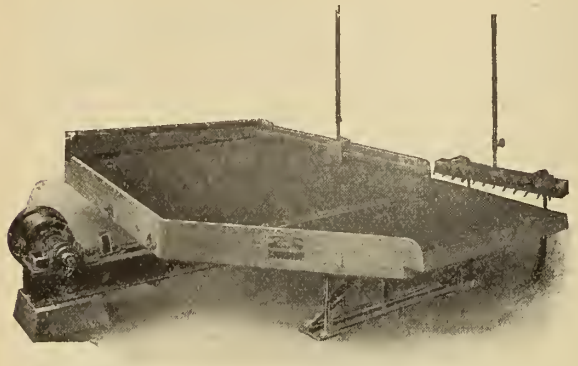

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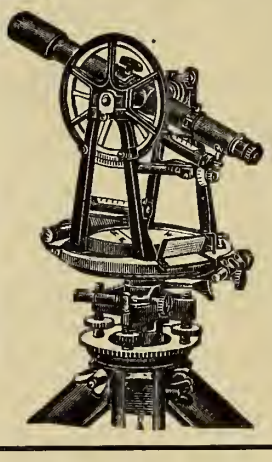

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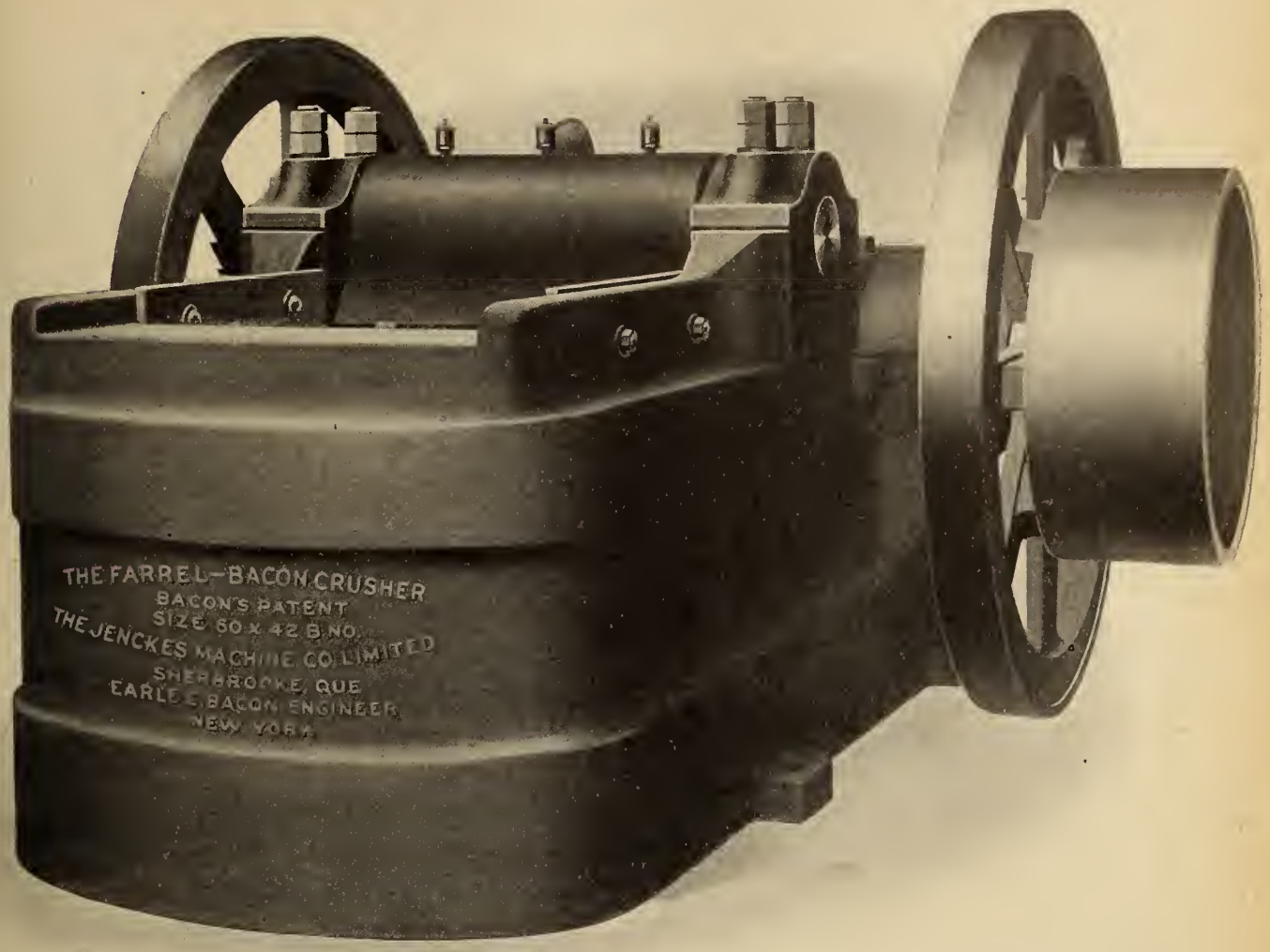

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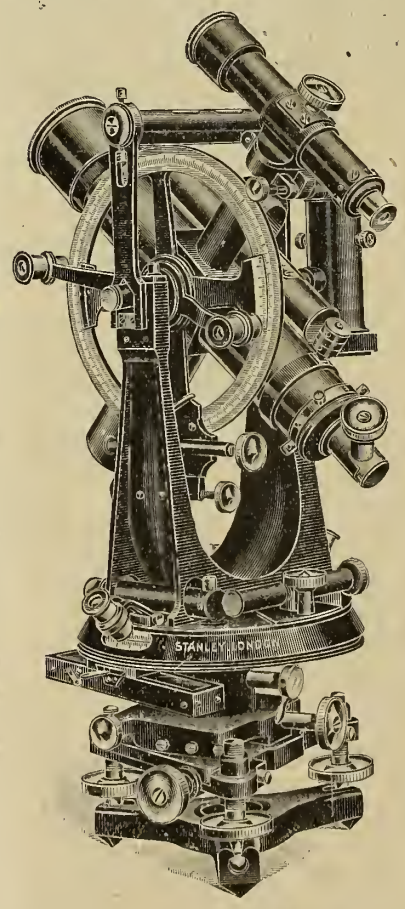

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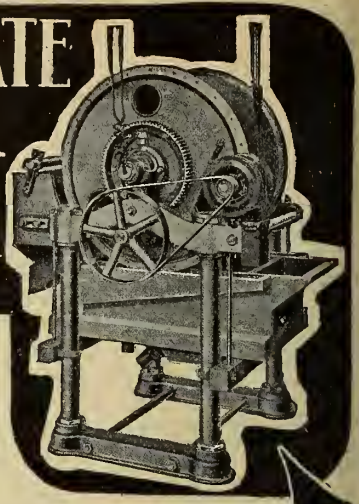

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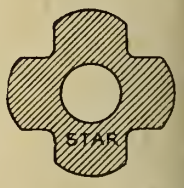

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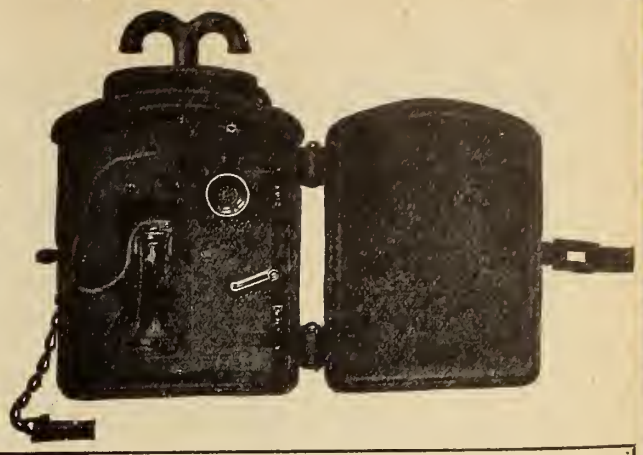

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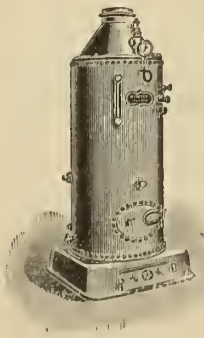

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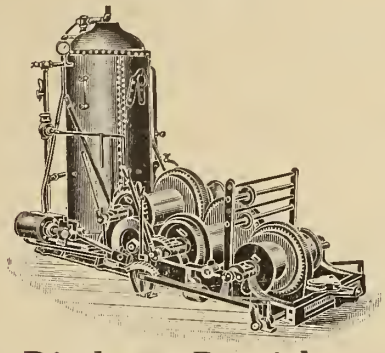

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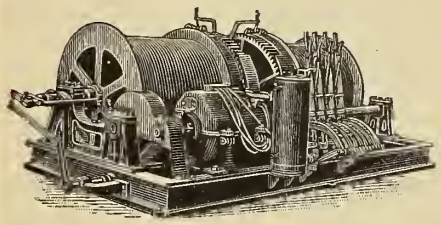

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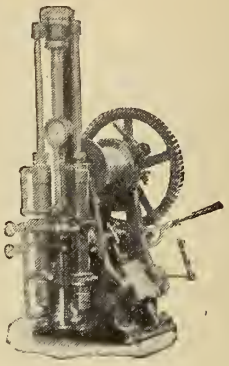

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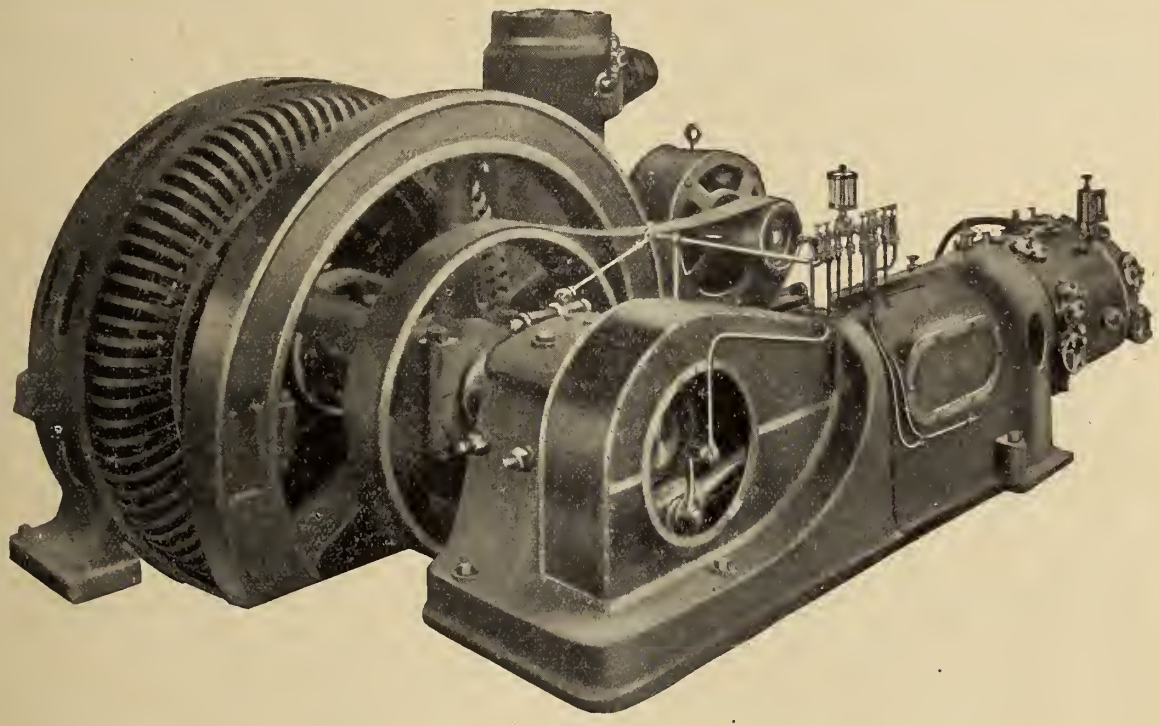

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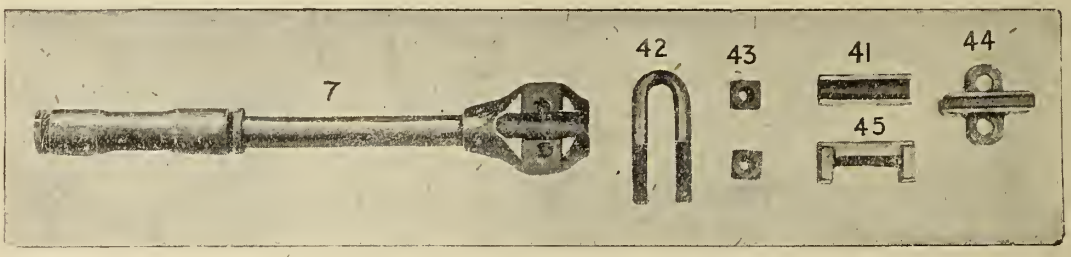

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THE CANADIAN MINING JOURNAL

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THE FOURTEENTH ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE.

It is hard to strive each year to bestow more encomiums upon those who manage the Annual Meeting of the Canadian Mining Institute. It may be said that it is no exaggeration to characterize the meeting that has just been held as equal to any in the history of the Institute, better far than several within our memory.

A more highly representative lot of visitors from the United States we have never had. A better consignment from Great Britain we could not have had. Further, the presence of delegates from British Columbia and Nova Scotia added to the effectiveness of every session.

The new order-in-council issued with horrid effrontery and accentuated by the presence of an incontrovertible sand-glass, made possible the presentation of a larger number of papers than nsual. That was good. But evil effects also flowed therefrom. Some speakers require a curb, some a snaffle; others the spur. A curb uniformly applied is too drastic. The paucity of discussion was marked, although what discussion there was reached a remarkable pitch of interest. As with the suggested amendments to the by-laws, the audience had not the wherewithal to begin a discussion.

Here, we believe, it lies with the council further to change the conduct of the meetings. Certain chosen papers should be printed and distributed. This obviates the necessity of reading in extenso, and also primes the audience.

Since the membership of the Institute is growing so rapidly, and since we are always assured a large attendance, it is time that provision be made for the sectionalizing of certain hours of each session. For instance, papers dealing with geology might be read before one group. Ore mining and metallurgy could be taken up before another group simultaneously. Matters pertaining to coal, or to non-metallic minerals, might be similarly handled. General papers, or papers of especially wide and timely interest might be read before the whole meeting. Tact, care, and much experimenting will be necessary before such an arrangement can be consummated. But none will deny that it is necessary.

A clearer system of announcing the programme for each day is desirable. We may repeat, also, that arrangements should be made for welcoming and looking after the younger members.

A last suggestion is that manufacturers of mining and metallurgical machinery be encouraged to exhibit at

suitable places any new devices or inventions that are worthy of special attention, and that an odd hour be assigned for the inspection of these. To the mining men from remoter districts this would be a boon. Working models of large machinery could be practically utilized.

Let us remark in closing that our suggestions would be most unfair were it not understood that the pronounced improvement effected this year in all details suggests still further smoothness.

The retiring President, the Secretary, the Council, and the local Committees deserve the highest praise for their ardour and activity.

Incidentally, a word of praise is due the daily papers, particularly the Toronto Globe, for the manner in which the meetings were reported to the public.

THE MINERAL PRODUCTION OF QUEBEC DURING 1911.

The Province of Quebec, and for several reasons it is unusually gratifying to report this, has made another stride in mining. $8,567,143 is the estimated value of last year's mineral production, as against $7,323,281. This addition, $1,243,862, or, roughly, 17 per cent., is credited principally to limestone, asbestos, copper-sulphur ore, and bricks. A large item, sand, is included for the first time. It is appraised at $114,500.

Referring to the largest industry, asbestos, the Superintendent of Mines, Mr. Denis, after mentioning the glutted condition of the market says: "On the whole, "from the commercial and technical standpoints, the "asbestos situation is satisfactory." The mines, he asserts, are in excellent condition.

For the rest, mica mining has improved; copper-sulphur ore mining also has become mueh more active and is showing great promise; while graphite production has more than held its own.

The Chibougamau incident has certainly done no harm to the Province. The Government has strengthened its hands by showing its determination to arrive at the truth. In variety and richness of natural resources the settled parts of Quebec offer all that can be desired. The development of the Eastern Townships is more important just now than the exploitation of the hinterland. On the other hand, every encouragement is being offered to prospector to fare forth and see what he can find in the northern regions.

THE IDOL OF QUICK RETURNS.

One of the relieving features of many of the Canadian Mining Institute debates and dinners is the presence of Mr. D. H. Browne, who possesses a truly Celtic sense of humour, seasoned and tempered by the exigencies of having had to earn a livelihood as a metallurgist.

Mr. Browne some weeks ago delivered an address at the annual dinner of the Engineering Society of the Kingston School of Mining. He took as the target of his remarks certain utterances of Mr. R. T. Crane, a Chicago manufaeturer.

Mr. Crane, who is an out-and-out utilitarian, perpetrated a pamphlet entitled, "The Futility of Technical Schools in Connection with Mechanics and Manufacturing or Electrical and Civil Engineering." (The futility of Mr. Crane, by the way, is amply proved by that meandering title.)

Just here one of Mr. Browne's statements is open to correction, or, at least, to modification. Mr. Crane attacks very violently the technical schools of the United States. His attack, says Mr. Browne, is equally applieable to Canadian sehools. This is hardly the case. Canadian technical sehools do superficially resemble American institutions. But there are several essentials in Canadian schools that differ from American. The chief difference is the higher standard for matriculation in Canada. Whether this is or is not, an advantage is beside the point. But the fact remains, and that fact differentiates widely the character of the technical schools of the two nations. Mr. Browne has overlooked this.

But merely to offer this kind of correction is to miss the wholly admirable and lofty spirit of Mr. Browne's address which is an inspiring plea for all those things that make life worth living. Mr. Crane, who is evidently a prolific pamphleteer, sneers at everything in education that does not bring quick and obvious practical results. In effect he urges the training of our young men as artisans. The more speedily they are equipped to earn a living, the better. Nothing should take the place of manual dexterity and physical skill.

Mr. Browne's answer is complete. "We will admit "once for all," says Mr. Browne, "that there are some "subjects that a university or a technical school can "not teach, does not attempt to teach, and should not "be expected to teach. A university does not aim to "make machines, but to make men. It does not take a "boy and perfect him along one narrow line. It aims "to lay broad foundations, to inculcate principles, to "train in culture, to foster a taste for all that makes life "livable and men and women lovable.

"Take this technical school at Kingston, for example "If a boy wishes to become a mine foreman, or a smelter "man, or an expert winder of commutators, he will "never get that training here. Any of his professors "would advise him to go into the mines at Granby, or "the smelter at Copper Cliff, or into the General Electric Works at Peterboro. In four or five years he "would be a skilled craftsman, he would earn three or "four dollars a day, he might even be in charge of "some commercial enterprise—but that is all. He "would be successful as he measures success—but what "price to pay for such a limited success! . . . Many "many generations have gone by since the preacher said "'Where there is no vision the people perish'—where "there is no vision, no broad outlook on life, no scope for "larger ambitions. What phrase could better describe

"the condition of one who spends his best years in "mere striving to learn a craft whereby to earn his "daily bread." "You will go from here in a few "years," says Mr. Browne, in concluding, "less skilled, "perhaps, in the profession you enter than many a "trained apprentice; . . . but when you do attain your "ideals you will have brought with you a greater capac- "ity for enjoyment, a broader outlook for life, a nobler "patriotism, and a higher ideal than if you had never "spent these years at Queen's, for you . . . will have "glimpsed the vision without which the people perish."

Thus Mr. Browne, from his sane, broad, and lofty view of life urges the young man to grasp those things that make for the individual's moral and intellectual growth and for the community's happiness and strength. These things cannot be attained in the routine of daily drudgery. They come as lessons, learned for the most part unconsciously, in daily contact with good men and good books. The atmosphere of the university is the best known means of bringing these lessons to the developing youth.

But to Mr. Browne's unquestionably sound diction something may be added. Not all of our young men can go to college, and many that do go must depend upon their earning power to meet all expenses. It is the rare youth who deliberately refuses to go to college. Those who cannot afford the time or the money are, obviously, placed at a disadvantage. Similarly, those who do graduate often find themselves unable to earn an adequate living. Upon the employer, therefore, there falls the moral obligation of doing something towards equalizing chances. And there are many ways of doing this. In the first place, the founding of college scholarships is a splendid method of helping the ambitious poor youth. If groups of mine operators were to contribute in this form to our mining schools immediate good would result. More important than this is the need of looking after the undergraduates, graduates, and apprentices at their work. The employer here can do much for them. Their surroundings can be made more edifying. They can be helped to improve themselves. In fact, a very slight exhibition of interest on the part of the employer will make his employee a better servant.

Canadian mine operators are prone to overlook all save the physical necessaries of their employees. Herein they neglect a duty and an opportunity. The day's wage is not everything, but it is wonderfully close to everything for a long period. It is totally unfair to get a foreman's work out of a student, pay him a navvy's wage, and ask him to take the experience as part of his remuneration. It is also unjust to place the educated young man in desolate surroundings with no thought of compensation other than money. In brief, it lies with the employer to give the young man a chance to grow. Beyond a certain point the money question will take care of itself.

THE MINERAL PRODUCTION OF CANADA DURING 1911.

The statistics submitted at the Annual Meeting of the Canadian Mining Institute by Mr. John McLeish, Statistician of the Mines Branch at Ottawa, give the grand total value of Canada's mineral production during 1911, as $102,291,686, as against $106,823,623 in the year 1910. This serious falling off, $4,531,937, was not unexpected in view of the oft-mentioned labour troubles in the western coal mines. From Mr. McLeish's general tabular statement it is seen that the largest item of loss is that of coal, the value of which was $30,909,779, in 1910, and $26,378,477 in 1911—the discrepancy being $4,531,302. This affected the production of every metal except pig-iron and nickel. The falling off in the last-named metal was not significant of anything beyond the fact that the two large Ontario companies were enlarging their plants. It may be added, also, that the curtailment of lead output may be put down to local causes.

In the case of non-metallic products, had it not been for the less amount of coal the total would have exceeded the previous year's total by about $3,000,000. Every member of the class showed gains, coal and petroleum alone excepted. Notable advances were made in cement, clay products, natural gas, and asbestos. Asbestos, perhaps, occupies a dubious position. For the rest, substantial growth is indicated. The table is a poignant sermon. It gives us an object lesson on the cost of a coal strike. The gross value of the mineral output of the country has been lessened by from six to eight million dollars because the operators and employees of our western coal mines had a disagreement.

On the basis of valuation adopted by Mr. McLeish, Ontario produced 41.72 per cent.; British Columbia, 20.76 per cent.; and Nova Scotia, 15.01 per cent. of the grand total. Ontario, Alberta, and British Columbia showed a falling off, the remaining Provinces a gain. This is somewhat a matter of bookkeeping, as the figures of the Ontario Bureau of Mines show an advance of 5.38 per cent. These confusing and often contradictory results are offensive. While they obtain we shall always be open to strong criticism from outsiders. Why the Provincial and the Dominion officials cannot get together and agree upon a common basis of valuation, we do not know. This has been so long a sore point that we have begun to believe in the existence of a full-grown nigger in the fence. It is our intention seriously to open this question during the coming summer.

Twenty-six years ago the value of the annual products of the mine in Canada was estimated at $10,221,255, or $2.23 per capita. To-day it stands at $102,291,686, or $14.20 per capita. Making all possible allowance for human error in compiling these figures, they must be approximately correct. And they are astounding.

Unless Canada is drawn into the coal miners' quarrel, the current year will keep Mr. McLeish busier than ever. If, at the next Annual Meeting, figures approaching $120,000,000 do not greet our eyes, we shall be disappointed.

We must not omit expressing our appreciation of the promptness with which the Mines Branch has brought out its preliminary report.

GOWGANDA.

Gowganda is anxiously waiting for the road from Elk Lake City to be gravelled. The Government is morally, if not verbally, committed to this. The district will produce about half a million ounces of silver. One mine has three years ore in reserve. Another has a large amount of milling ore developed. Still another is showing up well. A gravelled road would put an end to the awful waste of time and money that obtains at present, and would make motor haulage possible in the summer.

Gravel must be laid during the early spring before the roads will have dried, otherwise it will be wasted.

Impressions of the Institute Meeting.

The editor of The Canadian Mining Journal has asked me to record an impression of the recent meeting of the Mining Institute. As a fellow-journalist, I feel it incumbent upon me to accede to his polite request, all the more readily as I have a high regard for the journal under his direction. Moreover, being asked to express an opinion, I find it pleasant to convey the deserved compliment that logically follows, for, to my mind, the meeting proved an exceptional success. The attendance was sufficiently large and thoroughly representative. Local men were properly in evidence, the scientific chiefs of the mining departments in the Canadian universities were conspicuous, and the contingent from the southern republic was extraordinarily representative of the brains and energy that have contributed so largely to the rapid development of mineral industry in the United States. It is unfortunate that the British sister society was unable to send a delegation, and as the solitary unit from the other side, I can only transmit to my British friends my sincere conviction that they missed a unique opportunity to enlarge their knowledge of the men and things that are worth knowing. As an editor, I may claim to be able to appraise the value of technical writings or addresses, and of the discussions ensuing. If this be allowed, permit me to say that I consider that the records of the recent meeting would enrich the transactions of any technical society anywhere, and that among the papers read were at least a dozen that would (and probably will) grace the pages of the best technical periodicals extant.

The discussion on some subjects was unusually to the point, and if supplemented by later written contributions, it should go far to enhance the value of the original papers. The meetings were conducted with admirable spirit and orderliness. There was a general participation in the proceedings. Those who came from outside the Dominion were the recipients of a thoughtful hospitality that they will be unwilling to forget. As a critic impelled to speak truly or else to be silent, I gladly testify that it was the most pleasant, and, as far as my judgment goes, the most informative mining convention that I have ever attended.

T. A. RICKARD.

THE FOURTEENTH ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE

HELD IN TORONTO MARCH 6, 7 AND 8, 1912

To those of the Toronto members of the Institute who were early on the scene, it was apparent that the sessions were to be well attended. Much larger numbers of delegates were wandering round the King Edward Hotel on Tuesday evening than would ordinarily have been expected, and before proceedings had actually commenced on Wednesday morning, there were enough members on hand to tax the capacity of the King Edward ballroom.

The sprinkling of Canadian and foreign notabilities was distinctly large. One face, however, was missed. Dr. James Douglas could not be present, and his absence was sincerely regretted by all his numerous Canadian friends.

Wednesday Morning.

Shortly after 10 o'clock, the meeting was officially opened by the Hon. W. H. Hearst, Minister of Lands, Forests, and Mines, for Ontario, who welcomed the delegates and visitors in well-chosen language. Briefly reviewing the growth of Ontario's mineral industry, Mr. Hearst made a strong point of the outstanding position that the Province occupies as a producer of silver, having about one-seventh of the world's production to her credit. But, he added, despite our silver, copper, nickel, and gold territory already opened, there remain vastly larger tracts of promising mineral-bearing land not yet alienated from the Crown. Moreover, the huge slice of land to the north, just added to the Province, may contribute greatly to mining in the future. He earnestly desired the co-operation of the Institute and of all mining men in the work of his Department. He fully appreciated the meaning of mining, and he could read from the past part, at least, of the promise of the future. The Minister's address was admirably succinct, comprehensive, and timely.

Mr. H. Mortimer-Lamb then read a letter from the Governor-General in which as a patron of the Canadian Mining Institute, he expressed his regret that his duties in Ottawa prevented him from being present at the Annual Dinner, and extended his best wishes for the continued success of the Institute and of the industry that it represents.

The address of the retiring President, Dr. F. D. Adams, then followed. Touching on the slight decrease in the value of Canada's mineral output, he pointed out that this fact was due entirely to the coal strike in

Alberta and British Columbia. This had the effect, of course, of reducing the output of western smelters, and had cut down British Columbia's annual showing. On the other hand the Provinces of Ontario, Quebec, and Nova Scotia had achieved higher figures than ever before. Dr. Adams proceeded next to describe the work of the geologist in aiding the development of the country. In eloquent, though restrained, language he outlined the functions of the pioneer geologist and his relation to mining. Referring to the Institute, he announced that the membership had grown from 850 to 945 during the year. The establishment of branches had been a feature of the past year. This, in his opinion, was to be commended and encouraged. In all the efforts of the Institute to control and suggest legislation the branches would be of great assistance. He also commended the suggestion that semi-annual meetings be held by the Western members, many of whom could not attend the Annual Meetings.

The business of discussing Sections 4, 5, 6, 7, 33, 34, and 57 of the By-Laws was now taken up. A wide and radical divergence of opinion was apparent from the moment the discussion opened. The result was that the whole matter was put in the hands of a committee, consisting of Messrs. Ferrier, Penhale, McEvoy, Haultain, and Hedley. The opponents of the changes were strengthened by the ambiguity of the by-laws as at present worded. Common sense was not largely in evidence in the discussion. It became evident, in any case, that either the by-laws or some members need inspection and revising.

Brief presentations of the statements of last year's mineral production of the Dominion, of Quebec, of Ontario, and of British Columbia, were next on the programme. The speakers were, respectively, Messrs. McLeish, Denis, Gibson, and Jacobs. The Secretaries of Branches then gave short reports, Mr. W. E. H. Carter for Toronto, Col. John J. Penhale for Sherbrooke, Mr. Alex. H. Smith for Porcupine, and Mr. E. Jacobs for the Western Branch.

Wednesday Afternoon.

During this session papers were read and discussed bearing mainly on coal. "The Geology of the Nanaimo Coal District, B.C.," by C. H. Clapp; "The Ore and Coal Bearing Formations of the Yukon," by D. D. Cairnes; "The Fuel Problems of the Pacific," by H. Foster Bain (read by J. McEvoy); and "International Coal Competition," by Allen Greenwell (read by H. Mortimer-Lamb), were the features.

Wednesday Evening.

"Accident Prevention, or the Conservation of Human Life," by Dr. W. H. Tolman, and "Sanitary Conditions in Mining Camps," by Dr. Charles H. Hair, were the papers of the evening. Dr. Tolman's paper, profusely illustrated with slides, was particularly well presented.

Thursday Morning.

The general discussion of workmen's compensation and employers' liability, postponed from the previous evening, was now taken up. The whole question has been referred to a committee. "Concentration of Silver Ores," by Prof. Robert H. Richards; "The Evans-Stansfield Electric Furnace," by J. W. Evans; and "The Concentration of Iron Ores at Moose Mountain," by F. A. Jordon, took up the time until noon.

Thursday Afternoon.

Mr. T. A. Rickard's synopsis of his paper, "The Domes of Nova Scotia," evoked much interest and some debate. Mr. Rickard summed up justly his opinion of gold mining in Nova Scotia, and showed that he based his deductions on personal observation enlarged by the collection and digestion of a large mass of literature. His citations from other writers were numerous. He gave full credit to the work of Mr. E. R. Faribault, of the Geological Survey. Dr. A. E. Barlow and Mr. Reginald E. Hore then read papers on the Porcupine gold ores. Mr. J. B. Tyrrell presented a paper on the Copper Mine Country; Mr. Charles A. O'Connell on "The Past, Present, and Future of Cobalt," and Mr. Charles Reinhardt on "The Origin of the Ores of Cobalt."

Thursday Evening.

Thursday evening was given over entirely to the pleasant business of smoking and other incidentals. Dr. Kemp, as usual, re-established his reputation as a Truthful James, an explorer, and an artist. Col. John J. Penhale made an unsurpassable master of ceremonies.

THE FRIDAY SESSIONS.

The Friday Sessions were marked by the discussion of Mr. J. Parke Channing's paper on the Miami mine by an excellent address from Prof. F. H. Sexton, and by the presentation of several other good papers. A complete list will be found beneath.

The Dinner.

Never was dinner more promptly called and seldom more largely attended. Nearly 200 were seated in the ballroom of the King Edward. In a nearby room about 15 ladies attacked an identical bill of fare. Later they listened to the speeches. Among the guests of honour were the Hon. W. H. Hearst, Mr. J. Parke Channing, Mr. T. A. Rickard, Mr. John Birkenbine, Mr. E. B. Wilson, Mr. W. R. Ingalls, and Prof. F. H. Sexton.

During the evening the newly-elected President, Dr. A. E. Barlow, was given a warmly appreciative welcome by Mr. G. G. S. Lindsey, K.C.

List of Papers Presented.

"Early Mining on the Columbia River, B.C., by Frank L. Nason, West Haven, Conn.

"The Geology of the Nanaimo Coal District, B.C., by Charles H. Clapp, Ottawa, Ont.

"The Ore and Coal Bearing Formations of the Yukon," by D. D. Cairnes, Ottawa, Ont.

"Fuel Problems of the Pacific," by H. Foster Bain, San Francisco, Cal.

"International Coal Competition," by Allan Greenwell, London, Eng.

"The Evolution of Mining and Milling of Asbestos," by John J. Penhale, Sherbrooke, Que.

"The Fallacy of the Anticlinal Theory of Petroleum Deposits," by Eugene Coste, Calgary, Alta.

"The Occurrence of Manganese at New Ross, Nova Scotia," by H. E. Kramm, Ithaca, N.Y.

"The Tungsten Deposits of Nova Scotia," by Victor G. Hills, Moose River Gold Mine, N.S.

"Accident Prevention, or the Conservation of Human Life," by Dr. W. H. Tolman, Director, American Museum of Safety, New York.

"Sanitary Conditions in Mining Camps," by Dr. Charles H. Hair, Cobalt, Ont.

"Workmen's Compensation and Employers' Liability" (general discussion).

"Concentration of Silver-lead Ores in British Columbia," by S. S. Fowler, Nelson, B.C.

"Concentration of Silver Ores, with Special Reference to those of the Cobalt District," by Prof. Robert H. Richards, Boston, Mass.

"The Evans-Stansfield Electric Furnace," by J. W. Evans, Belleville, Ont.

"Zinc Smelting," by W. R. Ingalls, New York.

"The Concentration of Iron Ores at Moose Mountain, Ontario," by F. A. Jordon, Moose Mountain, Ont.

"Recent Improvements and Additions at the Canadian Copper Company's Works, Copper Cliff, Ont.," by David H. Browne. Copper Cliff, Ont.

"Monel Metal," by Dr. Wm. Campbell, Columbia University, New York.

"The Hardinge Mill," by H. W. Hardinge, New York.

"Some Characteristics of the Gold Bearing Veins of Nova Scotia," by E. Percy Brown, Bridgewater, N.S.

"The Domes of Nova Scotia," by T. A. Rickard, London, England.

"The Origin of the Quartz Veins of the Porcupine District," by Dr. A. E. Barlow, Montreal, Que.

"The Origin of the Porcupine Gold Deposits," by Reginald E. Hore, Houghton, Mich.

"The Newer Diabase in Preissac, Joanne, and adjacent Townships, Quebec," by Dr. J. A. Bancroft, Montreal, Que.

"The Coppermine Country," by J. B. Tyrrell. Toronto, Ont.

"Cobalt: Its Past, Present, and Future," by Charles A. O'Connell.

"The Origin of the Ores of Cobalt," by Carl Reinhardt, Cobalt, Ont.

"Ventilation in Metal Mines," by Frank C. Loring, Toronto, Ont.

(Title to be announced.) J. Parke Channing, New York.

"Co-operative Mining Investigation," by Prof. H. H. Stoek, Urbana, Ill.

"The Decrease in Value of Ore Shoots with Depth," by F. L. Garrison, Philadelphia, Pa.

"Industrial Education for Miners," by F. H. Sexton, Director, Department of Technical Education, Halifax, N.S.

"A New Departure in Mining Education," by H. G. Carmichael, Sudbury, Ont.

"Use of Geology in Iron Ore Exploration," by Dr. C. K. Keith, Madison, Wis.

"Glaciation and Its Effect on Mineral Veins," by J. B. Tyrrell, Toronto, Ont.

"Additional Notes on the Formation of Contact Zones in Limestones," by Dr. J. F. Kemp, Columbia University, New York.

(Title to be announced.) W. Lindgren, Washington, D.C.

"The Classification of Sudbury Ore Deposits as Affected by Faulting," by Dr. A. P. Coleman, University of Toronto, Toronto, Ont.

"Conservation as Affecting Mining," by James White, Ottawa, Ont.

"Mining Laws," by Horace V. Winchell, Minneapolis, Minn.

"Company Law," by J. M. Clark, Toronto, Ont.

THE NEW PRESIDENT C. M. I.

The announcement of the election of Dr. A. E. Barlow to the Presidency of the Canadian Mining Institute will be hailed with delight by his numerous friends, and will be deplored by no one save the most rabid partizan.

Without question, Dr. Barlow has been most assiduous, unselfish, and aggressive, both as ordinary member, as councillor, and as Vice-President. As President he can be trusted to work unremittingly for the good of the Institute.

Alfred Ernest Barlow, we learn on enquiry, was born in Montreal not so many years ago as we might have thought. In the year 1883, he secured the degree of A.B. at McGill University. Six years later he became an A.M.; 11 years after that a Sc.D. Throughout the period 1883-1906 he was an officer of the Geological Survey of Canada. The notable geological work that he has done, and the excellent monographs that he has written need not be listed here. Suffice it to mention the brilliant field work that brought reputation to him and to the Survey. That was his investigation of the Sudbury nickel-copper field. His memoir on this region is still a standard.

In 1906, Dr. Barlow resigned his position on the Survey to undertake very important professional work for a European syndicate. Since then he has been a free lance. While he lectures at McGill University occasionally, he has to do a great deal of travelling throughout Canada. In assuming the duties of President of the Institute he fully realizes that he will have to move all over Canada, and he is prepared to do so.

It is his intention, we may add, to attend the meeting of the Mining Society of Nova Scotia, late in this month. He will also visit the Ontario, Quebec, and Western Branches of the Institute during the coming year.

We can give Dr. Barlow full assurance of the hearty support of ourselves and, we are confident, of the Institute as a whole.

Alfred Earnes Barlow

PRELIMINARY REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1911

Prepared by JOHN McLEISH, B.A.,
Chief of the Division of Mineral Resources and Statistics.

Statistics Subject to Revision.

The mining industry during the years 1909 and 1910 showed such substantial progress and large increase in output that it is not surprising a slight falling off should be shown in 1911, particularly when it is remembered that the long continued strike of coal miners in Alberta and the Crow's Nest District of British Columbia not only seriously reduced the coal output, but also, because of the closing down of the Granby smelter on account of the coke shortage, caused a lower production of copper, silver and gold than would have otherwise been obtained.

The preliminary statistics herewith published, based upon direct returns from mine and smelter operators but subject to final revision, show the total value of the production in 1911 to have been $102,291,686, a falling off of $4,531,937 or 4 per cent. when compared with the production of $106,823,623 in 1910.

The production of the more important metals and minerals is shown in the following tabulated statement in which the figures are given for the two years, 1910 and 1911, in comparative form, and the increase or decrease in value shown. Tabulated statements for both years, in greater detail, will be found on subsequent pages of this pamphlet:

The sub-division of the mineral production in 1910 and 1911 by Provinces was approximately as follows:

Province.	1910. Value of Production.	1910. per cent. of Total.	1911. Value of Production.	1911. Per cent. of Total.
Nova Scotia	$14,195,730	13.29	$15,354,928	15.01
New Brunswick	581,942	0.54	611,597	0.60
Quebec	8,270,136	7.74	9,087,698	8.88
Ontario	43,538,078	40.76	42,672,904	41.72
Manitoba	1,500,359	1.40	1,684,677	1.65
Saskatchewan	498,122	0.47	618,379	0.60
Alberta	8,996,210	8.42	6,404,110	6.26
British Columbia	24,478,572	22.92	21,237,801	20.76
Northwest Territories	4,764,474	4.46	4,619,592	4.52
Dominion	$106,823,623	100.00	$102,291,686	100.00

Of the total production in 1911 a value of $46,197,428, or 45 per cent. is credited to metals, and $56,094,258 to non-metallic products. Practically all of the metals with the exception of pig iron show a falling off in production in so far as value is concerned. In the case of copper, however, there was an increased output of the metal, although the average price per pound was slightly lower than in 1910. The increase in pig iron production was quite considerable, although this is chiefly attributable to imported ore.

	1910 Quantity.	1910 Value.	1911 Quantity.	1911 Value.	Increase (+) or decrease (—) in value.
Copper ..... Lbs.	55,692,369	$7,094,094	55,848,665	$6,911,831	— $182,263
Gold ..... Ozs.	493,707	10,205.835	.....	9,762,096	— 443,739
Pig Iron ..... Tons.	800,797	11,245,622	917,535	12,306,860	+ 1,061,238
Lead ..... Lbs.	32,987.508	1,216,249	23,525,050	818,672	— 397,577
Nickel ..... Lbs.	37,271,033	11,181,310	34,098,744	10,229,623	— 951,687
Silver ..... Ozs.	32,869,264	17,580,455	32,740,748	17,452,128	— 128,327
Other metallic products	.....	510,081	.....	409,674	— 100,407
Total	.....	59,033,646	.....	57,890.884	— 1,142,762
Less pig iron credited to imported ores	695,891	9,594,773	875,349	11,693.456	+ 2,098,683
Total metallic	.....	49,438,873	.....	46,197,428	— 3,241,445
Asbestos and asbestic .... Tons	102,215	2,573.603	126,914	2,943.107	+ 369,504
Coal ..... Tons	12,909,152	30,909,779	11,291,553	26,378.477	— 4,531,302
Gypsum ..... Tons	525,246	934.446	505,457	978,863	+ 44,417
Natural gas	.....	1,346,471	.....	1,820,923	+ 474,452
Petroleum ..... Brls.	315.895	388,550	291,092	357,073	— 31,477
Salt ..... Tons	84,092	409,624	91,582	443,004	+ 33,380
Cement ..... Brls.	4,753,975	6,412,215	5,635,950	7,571,299	+ 1,159,084
Clay products	.....	7,629.956	.....	8,317,709	+ 687,753
Lime ..... Bush	5,848,146	1,137.079	7,227,310	1,493,119	+ 356,040
Stone	.....	3,650,019	.....	3,680,371	+ 30,352
Miscellaneous non-metallic ...	.....	1,993,008	.....	2,110,313	+ 117,305
Total non-metallic	.....	$57,384,750	.....	$56,094,258	— $1,290,492
Grand total	.....	$106,823,623	.....	$102,291,686	— $4,531,937

Amongst the non-metallic products increases are shown in the production of arsenic, asbestos, feldspar, graphite, natural gas, pyrites, salt and in nearly all of the structural materials, including cement, clay products, stone, lime, etc.

Outside of the metallic products, the principal decreases are in coal and petroleum; the falling off in value of coal production alone being practically equivalent to the total net decrease for the year.

There is comparatively little change in the relative importance of the Provinces as mineral producers—Ontario contributed nearly 42 per cent. of the total in 1911; British Columbia nearly 21 per cent.; Nova Scotia 15 per cent.; Quebec nearly 9 per cent., and Alberta 6 per cent. The order in 1910 was the same, except that Alberta slightly exceeded Quebec in production.

The Provinces showing an increased output for the year are Nova Scotia, New Brunswick, Quebec, Manitoba and Saskatchewan; those showing a falling off being Ontario, Alberta and British Columbia.

In Nova Scotia the coal industry was particularly active and to that and the clay and stone industries is the increase in this Province to be chiefly ascribed. There was a slight increase in New Brunswick. In Ontario the net result was a decrease of about $1,000,000, being chiefly in copper, nickel, and petroleum; on the other hand there were substantial increases in nearly all of the other products of which a great variety is obtained in this Province. Manitoba produces gypsum, clay and stone products; and Saskatchewan coal and clays.

The difficulties incident to coal mining operations in Alberta and British Columbia have already been noted and there have been the chief cause of falling off in production in these Provinces. In British Columbia, notwithstanding the coke shortage and the consequent closing down of the Granby smelter for a portion of the year, there was still a slight increase in the copper production, although the output of silver, lead and zinc was less than in 1910.

The Mineral Production of Canada in 1911.

(Subject to revision.)

Product— Metallic.	Quantity.	Value.
Copper, value at 12.376 cents per pound. Lbs.	55,848,665	$6,911,831
Gold		9,762,096
Pig iron from Canadian ore Tons.	42,186	613,404
Iron ore sold for export Tons	39,162	86,812
Lead, value at 3.48 cents per pound Lbs.	23,525,050	818,672
Nickel, value at 30 cents per pound Lbs.	34,098,744	10,229,623
Silver, value at 53.304 cents per oz Ozs.	32,740,748	17,452,128
Cobalt and nickel oxides		221,790
Zinc ore	2,590	101,072
Total		46,197,428
Non-Metallic.		
Actinolite Tons	67	736
Arsenic, white Tons	2,097	76,237
Asbestos Tons	100,893	2,922,062
Asbestic Tons	26,021	21,045
Chromite Tons	27	351
Coal Tons	11,291,553	26,378,477
Corundum Tons	1,472	161,873
Feldspar Tons	17,718	51,924
Fluorspar Tons	34	238
Graphite Tons	1,269	69,576
Grindstones Tons	5,312	49,942
Gypsum Tons	505,457	978,863
Manganese Tons	5½	300
Magnesite Tons	991	5,531
Mica Tons		119,863
Mineral pigments—		
Barytes Tons	50	400
Ochres Tons	3,622	28,333
Mineral water		223,758
Natural gas		1,820,923
Peat Tons	1,463	3,817
Petroleum, value at $1.22⅔ per barrel. Brls.	291,092	357,073
Phosphate Tons	558	4,928
Pyrites Tons	82,666	365,820
Quartz Tons	60,526	83,865
Salt Tons	91,582	443,004
Talc Tons	7,300	22,100
Tripolite Tons	20	122
Total		34,191,161
Structural Materials and Clay Products.		
Cement, Portland Brls.	5,635,950	$7,571,299
Clay products—		
Brick, common, pressed, paving		6,521,558
Sewerpipe		799,756
Fireclay, drain tile, pottery, etc.		996,395
Lime Bush.	7,227,310	1,493,119
Sand and gravel (exports) Tons	573,494	408,110
Sand-lime brick		424,241
Slate Sq.	1,833	8,248
Stone—		
Granite		880,309
Limestone		2,282,146
Marble		140,903
Sandstone		377,013
Total structural materials and clay products		21,903,097
All other non-metallic		34,191,161
Total value, metallic		46,197,428
Total value, 1911		102,291,686

The average monthly prices of the metals in cents per pound for several years past are shown herewith:

	1907. Cts.	1908. Cts.	1909. Cts.	1910. Cts.	1911. Cts.
Copper, New York	20.004	13.208	12.982	12.738	12.376
Lead, New York	5.325	4.200	4.273	4.446	4.420
Lead, London	4.143	2.935	2.839	2.807	3.035
Lead, Montreal*					3.480
Nickel, New York	45.000	43.000	40.000	40.000	40.000
Silver, New York	65.327	52.864	51.503	53.486	53.304
Spelter, New York	5,962	4.720	5.503	5.520	5.758
Tin, New York	38.166	29.465	29.725	34.123	42.281

*Quotations furnished by Messrs Thomas Robertson & Company, Montreal, Que.

Smelter Production.

General statistics of smelter production have been collected by this branch since 1908. Complete returns have been received for the year 1911, with the exception of one or two plants recently established for the treatment of Ontario silver cobalt ores. It should also be explained that the accompanying statistics include the treatment of a small quantity of imported ores in the British Columbia smelters.

The total quantity of ores treated in 1911 was 2,192,727 tons as compared with 2,683,714 tons treated in 1910.

The ores treated may be conveniently classified as follows:

	1909. Tons.	1910. Tons.	1911. Tons.
Nickel-copper ores	462,336	628,947	610,834
Silver-cobalt-nickel-arsenic ores	8,384	9,466	8,504
Lead and other ores treated in lead furnaces	54,539	57,549	55,408
Copper-gold-silver ores	1,850,889	1,987,752	1,517,981
Total	2,376,148	2,683,714	2,192,727

The closing down of the Granby smelter, due to coke shortage was the principal cause of the falling off in copper-gold ores treated.

The products obtained in Canada from the treatment of these ores include: refined lead produced at Trail, B.C., and fine gold, fine silver, copper sulphate and antimony produced from the residues of the lead refinery; silver bullion, white arsenic, nickel oxide and cobalt oxide produced in Ontario from the Cobalt District ores. In addition to these refined products, blister copper, copper matte and nickel copper matte are produced and exported for refining outside of Canada.

The aggregate results of these smelting and refining operations for the years 1910 and 1911 are briefly summarized in the following table:

Smelter and Refinery Production in Canada, 1910 and 1911.

	Refined products.	Metals in matte, blister, and base bullion.	Refined products.	Metals in matte blister, and base bullion.
Antimony, lbs.	.....	.....	30	.....
Gold, ozs.	13,298	197,181	15,270	175,189
Silver, ozs.	16,373,799	2,136,414	17,711,077	612,401
Lead, lbs.	32,987,508	.....	23,525,050	.....
Copper, lbs.	.....	56,149,299	.....	47,788,131
Copper sulphate, lbs.	163,228	.....	197,187	.....
Nickel, lbs.	.....	37,587,676	.....	34,098,744
Cobalt and nickel oxides, lbs.	13,508	.....	15,174	.....
Mixed oxides of cobalt and nickel, lbs.	108,178	.....	127,224	.....
White arsenic, lbs.	3,003,467	.....	4,194,209	.....

Smelter products shipped outside of Canada for refining were. Blister copper, carrying gold and silver values 10,710 tons in 1911, as compared with 13.918 tons in 1910; copper matte carrying gold and silver values 11,320 tons in 1911, as against 11,519 tons in 1910; Bessemer nickel copper matte carrying small gold and silver values as well as metals of the platinum group 32,607 tons in 1911, as compared with 35,033 tons in 1910.

Gold.

The gold production in 1911 is estimated as approximately $9,762,096, which, compared with the 1910 production $10,205,835, shows a falling off of $443.739. The Yukon placer production in 1911 is estimated at $4,580,000, as against $4,550,000 in 1910, the total exports on which royalty was paid during the calendar year, according to the records of the Interior Department, being 277,430.97 ounces in 1911, and 275,472.51 ounces in 1910. The British Columbia production in 1911 was $4,989,524, of which the placer production, as estimated by the Provincial Mineralogist, was $468,000, smelter recoveries and bullion obtained from milling ores being valued at $4,521,524.

The production in Nova Scotia is estimated at $142,000 all from milling ores. In Quebec there was a small recovery from alluvial workings and a small content in the pyrite ores shipped, the total value of production being $12,443. Returns so far received from Ontario show a production of $37,929.

The exports of gold-bearing dust, nuggets, gold in ore, etc., in 1911 were valued at $7,493,523.

Gold was imported during 1911 in bars, blocks, ingots, etc., to the value of $924,233.

Silver.

The silver production of Canada which has been very rapidly increasing during the past few years will probably show but little change in 1911.

Returns so far received appear to indicate a falling off of about 128,516 ounces. The total production of the year is estimated at 32,740,748 ounces valued at $17,452,128, of which 30,761,690 ounces were from Ontario, 1,910,323 ounces from British Columbia, 50,300 ounces from the Yukon, and 18,435 ounces from Quebec.

The production in Ontario was slightly greater than that of the previous year and in British Columbia a falling off of nearly half a million ounces is shown.

For British Columbia the figures represent the recovery as silver bullion or silver contained in smelter products, while for Ontario the figures represent the total silver contents of ore and concentrates shipped less five per cent. allowed for smelter losses, together with bullion shipments.

The total shipments of ore and concentrates from the Cobalt District and adjacent mines were about 16,234 tons, containing approximately 28,817,198 ounces in addition to which 3,334,052 ounces were shipped as bullion. The average silver content of ore and concentrates shipped was thus about 1,744 ounces, or $929.62 per ton, as compared with an average of 867 ounces in 1910 and 840 ounces in 1909. The 1911 shipments were chiefly high grade ore averaging over 3,400 ounces and concentrates averaging over 850 ounces.

The shipments in 1910 were 28,684 tons of ore containing 23,797,111 ounces of silver or an average of 830 ounces per ton; 6,943 tons of concentrate containing 7,111,579 ounces, or an average of 1,024 ounces per ton and bullion containing 1,003,111 fine ounces.

The exports of silver in ore, etc., as reported by the Customs Department were 31,216,725 ounces, valued at $15,807,366. There was also an importation of silver in bars, blocks, sheets, etc., valued at $847,645.

The price of refined silver in New York varied between a minimum of 51⅝ cents per ounce in February, and a maximum of 56⅜ cents in November, the average monthly price being 53.304, as compared with an average monthly price of 53.486 in 1910.

Copper.

There is practically no production of refined copper in Canada, and the production is represented by the copper contents of smelter products, matte and blister copper, produced, together with the amount of copper contained in ores exported estimated as recoverable.

The total production on this basis in 1911 was 55,848,665 pounds, valued at 6,911,831, as compared with 55,692,369 pounds valued at $7,094,094 in 1910, an in-

crease in quantity of 156,296 pounds, but a falling off in total value owing to the slightly lower price of copper in 1911.

The total copper contents of ores shipped in 1911 was approximately 67,282,590 pounds, being 3,123,189 pounds from Quebec, 21,402,221 pounds from Ontario, and 42,757,180 pounds from British Columbia. This record is of special interest as illustrating the distinction between ore contents and smelter recoveries.

Of the production or smelter recovery in 1911, Quebec Province is credited with 2,436,190 pounds, as against 877,347 pounds in 1910. This is altogether from pyrite ores, which are mined primarily for their sulphur contents. Ontario's production in 1911 was 17,932,263 pounds, as compared with 19,259,016 pounds in 1910, all being from the nickel-copper ores of the Sudbury district.

The production in British Columbia, notwithstanding the failure of the domestic coke supply due to strikes in the coal mines of the Crow's Nest Pass district and the consequent shutting down of the Granby smelter for nearly five months, shows a slight increase, being estimated at 35,480,212 pounds in 1911, as against 35,270,006 pounds in 1910.

The British Columbia Copper Co. operated with larger output, using imported coke, and production from Coast mines, particularly the Britannia and Marble Bay, was specially active. The increased production from these mines more than balanced the falling off at Granby.

The New York price of electrolytic copper varied during the year between the limits of 11.85 cents and 14.05 cents per pound, the average being 12.376. During December the price ranged from 13 to 14 cents. The average monthly price in 1910 was 12.738 cents.

The total exports of copper contained in ore, matte and blister, etc., according to Customs Department returns, were 55,287,710 pounds, valued at $5,467,725, which agrees fairly closely with the record of production.

The total imports of copper in 1911 were valued at $4,936,459, and included crude and manufactured copper to the extent of 35,155,550 pounds, valued at $4,632,452; copper sulphate 2,191,899 pounds valued at $88,419, and other copper manufactures valued at $215,588.

Lead.

The total production of pig and manufactured lead in 1911 was 23,525,050 pounds, valued at $818,672, or an average of 3.48 cents per pound, the average wholesale or producer's price of pig lead in Montreal for the year. There was also small production of lead concentrate from Calumet Island, Que., the shipments being about 45 tons.

The production of lead in 1910 was 32,987,508 pounds, thus showing a considerable falling off in 1911. The decrease is probably chiefly due to the diminished tonnage from the St. Eugene mine in East Kootenay and the idleness of some of the more important mines of the Slocan following the destruction of the Kaslo and Slocan Railway by forest fires in 1910. The Bear Lake branch of the C.P.R., now under construction, will provide shipment facilities for these properties.

The Sandon and Silverton camps would seem to promise an increased tonnage of silver-lead ores in the near future.

The exports of lead in ore in 1911 are reported as 32 tons and of pig lead only 36 tons, as compared with exports of 23 tons and 3,856 tons respectively in 1910.

The total value of the imports of lead and lead products in 1911 was $1,049,276, including 13,135 tons in the form of pig lead, bars, sheets, tea lead, etc., valued at $706,020; manufactures of lead, valued at $108,012; litharge and lead pigments having an equivalent lead content of approximately 2,395 tons, valued at $235,244.

The total value of the imports of lead and lead products in 1910 was $833,743, and with the exception of manufactures, valued at $107,688, represented an equivalent lead content of 10,544 tons.

The average monthly price of lead in Montreal during 1911 was 3.48 cents per pound and in Toronto 3.53 cents. These are producer's prices for lead in car lots as per quotations kindly furnished by Messrs. Thos. Robertson & Co. The average monthly price of lead in New York during the year was 4.42 cents, and in London £13.970 per long ton, equivalent to 3,035 cents per pound.

The amount of bounty paid during the twelve months ending December 31, 1911, on account of lead production was $219,557.70, as compared with payments of $318,308.28 in 1910.

Nickel.

The mining and smelting of nickel copper ores in the Sudbury District of Ontario was carried on actively throughout the year, and although the production was slightly less than in 1910, it was still very much larger than in any previous year. Active operations were, as usual, carried on by the Mond Nickel Company at Victoria Mines and the Canadian Copper Co. at Copper Cliff, Creighton, Crean Hill, etc., while the Dominion Nickel Company continued to develop its property at Norman Station.

The ore is first roasted and then smelted and converted to a Bessemer matte containing from 77 to 82 per cent. of the combined metals, copper and nickel, the matte being shipped to the United States and Great Britain for refining. A portion of the matte is now used for the production of the alloy monel metal which is obtained directly from the matte without the intermediate refining of either nickel or copper.

The total production of matte in 1911 was 32,607 tons, valued at the smelters at $4,945,593, a decrease of 2,462 tons, or 6.9 per cent. from the production of 1910. The metallic contents were copper, 17,932,263 pounds, and nickel, 34,098,744 pounds.

The aggregate results of the operations on the Sudbury District nickel-copper ores during the past four years were as follows, in tons of 2,000 pounds:

	1908.	1909.	1910.	1911.
Ore mined	$409,551	$451,892	$652,392	$612,511
Ore smelted	360,180	462,336	628,947	610,834
Bessemer matte produced	21,197	25,845	35,033	32,607
Copper contents of matte	7,503	7,873	9,630	8,966
Nickel contents of matte	9,572	13,141	18,625	17,049
Value matte shipped	$2,930,989	$3,913,017	$5,380,064	$4,945,592
	Pounds.	Pounds.	Pounds.	Pounds.
Exports to Great Britain	2,554,486	3,843,763	5,335,331	5,023,393
Exports to U.S.	16,865,407	21,772,635	30,679,451	27,596,578
	19,419,893	25,616,398	36,014,782	32,619,971

The price of refined nickel in New York remained practically constant throughout the year—quotations in the Engineering and Mining Journal being large lots, contract business, 40 to 45 cents per pound during the first four months and 40 to 50 cents from May to December. Retail spot from 50 cents for 500-pound lots up to 55 cents for 200-pound lots. The price for electrolytic is 5 cents higher.

The imports of nickel anodes in 1911 were valued at $34,199, as compared with $23,317 in 1910.

Iron.

Iron Ore.—The total shipments of iron ore in 1911 are reported as 210,344 tons, valued at $522,319. These may be classified as magnetite 72,945 tons, and hematite 137,399 tons.

In 1910 the total shipments were 259,418 tons, comprising magnetite 127,768 tons; hematite 130,380 tons, and bog ore 1,270 tons.

Exports of iron ore from Canada during 1911 are recorded by the Customs Department as 37,686 tons, valued at $133,411. The exports were chiefly from Bathurst, New Brunswick.

The shipments from the Wabana mines, Newfoundland in 1911 by the two Canadian companies operating there were 1,181,463 short tons of which 765,184 tons were shipped to Sydney and 416,279 to the United States and Europe.

Pig Iron.—The total production of pig iron in Canadian blast furnaces in 1911 was 917,535 tons of 2,000 pounds, valued at approximately $12,306,860, as compared with 800,797 tons, valued at $11,245,622 in 1910.

Of the total output in 1911, 20,758 tons were made with charcoal as fuel and 896,777 tons with coke. The classification of the production according to the purpose for which it was intended was as follows:

Bessemer, 208,626 tons; basic, 464,220 tons, foundry and miscellaneous, 244,686 tons.

The amount of Canadian ore used during 1911 was 67,434 tons; imported ore, 1,628,368 tons; mill cinder, etc., 30,298 tons.

The amount of coke used during the year was 1,121,-321 tons, comprising 543,933 tons from Canadian coal, and 577,388 tons imported coke or coke made from imported coal. There were also used 1,190,459 bushels of charcoal.

Limestone flux was used to the extent of 625,216 tons.

In connection with blast furnace operations there were employed 1,778 men and $1,097,355 were paid in wages.

The total daily capacity of 18 completed furnaces was, according to returns received, 3,630 tons, and the number of furnaces in blast December 31, 1911, was 12.

The production of pig iron by Provinces in 1910 and 1911 was as follows:

Production of Pig Iron by Provinces, 1910 and 1911.

	1910			1911		
	Tons.	Value.	Value per Ton.	Tons.	Value.	Value per Ton.
Nova Scotia—						
	$350,287	$4,203,444	$12.00	$390,242	$4,682,904	$12.00
Quebec—						
	3,237	85,255	26.34	658	17,282	26.34
Ontario—						
	447,273	6,956,923	15.55	526,635	7,606,674	14.44
Total	800,797	$11,245,622	$14.04	917,535	$12,306,860	$13.41

The exports of pig iron during the year are reported as 5,870 tons, valued at $271,968, an average of $46.33 per ton. Probably the greater part of this is ferro-silicon and ferro-phosphorus, produced at Welland and Buckingham, respectively.

There were imported during the year 208,487 tons of pig iron, valued at $2,610,989, and 17,226 tons of ferro-manganese, etc., valued at $429,465.

Steel.—The production of steel ingots and castings in 1910 is reported as 876,215 tons of 2,000 pounds, of which 861,493 tons were ingots, and 14,722 tons castings.

The prdouction in 1910 was 822,284 tons, including 803,600 tons of ingots and 18,684 tons of castings.
valued at $18,794,192, or a total of 14,558,892 tons, valued at $39,292,591.

The production of open hearth and Bessemer steel has been for four years as follows:

Production of Steel, 1908, 1909, 1910, 1911.

	1908.	1909.	1910.	1911.
	Tons.	Tons.	Tons.	Tons.
Ingots—Open-hearth (basic)	443,442	535,988	580,932	651,676
Bessemer (acid)	135,557	203,715	222,668	209,817
Castings—Open-hearth	9,051	14,013	18,085	13,982
Other steels	713	1,003	599	740
Total	588,763	754,719	822,284	876,215

Asbestos.

For a number of years past the annual output of asbestos has exceeded the sales. In 1911, however, the sales have been greatly increased, but at considerably reduced prices. Returns received for the year 1911 show a total output of 96,299 tons, as compared with 100,430 tons in 1910. The sales in 1911 are, however, reported as 100,893 tons, valued at $2,922,062, or of $28.96 per ton, as compared with 77,508 tons valued at $2,555,974, or an average of $32.98 per ton in 1910, an increase of 23,385 tons, or 30 per cent. in quantity, but only $366,088, or 14 per cent. in total value. Stocks on hand at December 31, 1911, are reported as 34,568 tons, valued at $1,509,100, as compared with 41,903 tons, valued at $1,943,171 on December 31, 1910.

The average number of men employed in mines and mills during 1911, was 2,707 at a wage cost of $1,231,896.

The total quantity of asbestos rock sent to mills is reported as 1,484,691 tons, which, with a mill production of 91,237 tons, shows an average estimated recovery of about 6.14 per cent.

The following tabulated statement shows the output and sales during 1911 and the stock on hand at the end of the year:

	Output.	Sales.			Stock on hand Dec. 31.	
	Tons.	Tons.	Value.	Per ton.	Tons.	Value.
Crude No. 1—						
	1,467.9	1,301.4	$342,855	$263.45	1,256	$327,508
Crude No. 2—						
	3,594.5	3,562.7	402,107	112.86	3,222.7	404,198
Mill stock No. 1—						
	20,376	18,315	916,678	50.05	8,471	380,570
Mill stock No. 2—						
	39,289	47,326	991,370	20.95	17,794	365,457
Mill stock No. 3—						
	31,572	30,388	269,052	8.85	3,824	31,367
Total asbestos—						
	96,299.4	100,893.1	$2,922,062	$28.96	34,567.7	$1,509,100
Asbestic	26,021	21,045	81	.....	.....	.....

In the absence of a uniform classification of asbestos of different grades the above sub-divisions have been adopted purely on a valuation basis; crude No. 1 comprising material valued at $200 and upwards, and crude No. 2 under $200; mill stock No. 1 includes stock valued at from $30 to $100; No. 2 from $15 to $30. No. 3 under $15.

Output, sales and stocks in 1910 were as follows:

	Output.	Sales.			Stock on hand Dec. 31.	
	Tons.	Tons.	Value.	Per ton.	Tons.	Value.
Crude No. 1—	2,181	1,817	$471,675	$259.58	1,702	$446,675
Crude No. 2—	3,268	1,923	192,833	100.28	3,219	440,571
Mill stock No. 1—	16,720	13,480	735,244	54.54	6,978	398,895
Mill stock No. 2—	56,395	43,414	1,013,251	23.34	26,613	628,528
Mill stock No. 3—	21,866	16,874	142,971	8.47	3,391	29,177
	100,430	77,508	$2,555,974	$32.98	41,903	$1,943,846
Total Asbestos	100,430	77,508	$2,555,974	$32.98	41,903	$1,943,846
Asbestic	.....	24,707	17,629	0.71	.....	.....

Exports of asbestos during the twelve months ending December 31, 1911, are reported by the Customs Department as 75,120 tons, valued at $2,067,259, comprising 62,551 tons, valued at $1,732,541 to the United States; 7,511 tons, valued at $192,993 to Great Britain; 1,841 tons, valued at $62,737, to Belgium; 2,596 tons, valued at $52,047 to France; 361 tons, valued at $20,494 to Germany, and 260 tons, valued at $6,447 to other countries.

The imports of manufactures of asbestos during the same period are reported as valued at $319,815.

Coal and Coke.

The long continued strike which took place in the coal mines of Southern Alberta and Eastern British Columbia, was responsible for a considerable falling off in the coal production of Canada in 1911.

The total coal production during the past year, comprising sales and shipments, colliery consumption and coal used in making coke is estimated at 11,291,553 tons of 2,000 lbs., valued at $26,378,477. This is a decrease of 1,617,599 tons, or nearly 12.53 per cent. from the production of 1910, which was 12,909,152 tons, valued at $30,909,779.

There was an increase of 562,978 tons in the Nova Scotia production, that of New Brunswick remained practically stationery, while an increase of about 23,097 tons is shown in Saskatchewan.

In Alberta, the decrease was about 1,396,412 tons, or 48 per cent., and British Columbia also shows a falling off of 794,243 tons, or nearly 24 per cent.

The production by Provinces was approximately as follows, the figures for 1910 being also given:

Province.	1910. Tons.	1910. Value.	1911. Tons.	1911. Value.
Nova Scotia	6,431,142	$12,919,705	6,994,120	$14,050,687
British Columbia .	3,330,745	10,408,580	2,536,502	7,926,569
Alberta.	2,894,469	7,065,736	1,498,057	3,933,958
Saskatchewan . . .	181,156	293,923	204,253	342,921
New Brunswick ..	55,455	110,910	55,781	111,562
Yukon Territory..	16,185	110,925	2,840	12,780
Totals	12,909,152	$30,909,779	11,291,553	$26,378,477

The exports of coal in 1911 were 1,500,639 tons, valued at $4,357,074, as compared with exports of 2,377,049 tons in 1910, valued at $6,077,350, a decrease in exports of 876,410 tons.

Imports of coal during the year include bituminous 8,905,815 tons, valued at $18,407,603; slack, 1,632,500 tons, valued at $2,090,796, and anthracite 4,020,577, valued at $18,794,192, or a total of 14,558,892 tons, valued at $39,292,591.

The imports of coal in 1910 were: Bituminous, 5,966,466 tons; slack, 1,365,281 tons, and anthracite, 3,266,235 tons, or a total of 9,872,924.

Coke.—The total production of oven coke in 1911 was 847,402 tons, valued at $2,340,674, as compared with the production of 902,715 tons, valued at $3,462,872 in 1910. The total quantity of coal charged to ovens was 1,228,700 short tons.

By Provinces the production was: Nova Scotia, 469,305 tons; Ontario, 259,554 tons (made from imported coal); Alberta, 36,216 tons, and British Columbia, 82,327 tons. All the coke produced was used in Canada with the exception of 9,290 tons, sold for export to the United States.

The quantity of coke imported during the calendar year was 751,389 tons, valued at $1,843,248, as compared with imports of 737,088 tons, valued at $1,908,725 in 1910.

Petroleum and Natural Gas.

A further falling off is shown in the output of petroleum, the production in 1911 being 291,092 barrels, or 10,188,219 gallons, valued at $357,073, as compared with 315,895 barrels or 11,056,337 gallons, valued at $388,550 in 1910. The average price per barrel at Petrolea in 1911 was $1.22 2/3, and in 1910, $1.23.

These statistics of production have been furnished by the Trade and Commerce Department, and represent the quantities of oil on which bounty was paid, the total payments being $152,823.29 in 1911, and $165,845.06 in 1910.

The production in Ontario by districts as furnished by the Supervisor of Petroleum Bounties was in 1911 as follows, in barrels. Lambton, 184,450; Tilbury and Romney, 48,708; Bothwell, 35,244; Dutton, 6,732, and Onondaga, 13,501. In 1910, the production by districts was: Lambton, 205,456; Tilbury and Romney, 63,058; Bothwell, 36,998; Leamington, 141; Dutton, 7,752, and Onondaga 1,005.

The production in New Brunswick in 1911 was 2,461 barrels, as against 1,485 barrels in 1910.

Exports of refined oil in 1911 were 489 gallons, valued at $73. There was also an export of naphtha and gasoline of 23,959 gallons, valued at $4,427.

The imports of petroleum and petroleum products again show a very large increase. The total imports of petroleum oils, crude and refined in 1911 was 116,892,689 gallons, valued at $6,009,730, in addition to 1,959,787 pounds of wax and candles, valued at $106,424. The oil imports included crude oil, 71,637,533 gallons, valued at $2,187,952; refined and illuminating oils, 13,690,962 gallons, valued at $722,403; gasoline, 23,338,773 gallons, valued at $1,976,032; lubricating oils, 5,308,917 gallons, valued at $806,452, and other petroleum products, 2,916,504 gallons, valued at $316,891.

The total imports in 1910 were 84,629,334 gallons of petroleum oils, crude and refined, valued at $4,826,763, and 1,362,235 pounds of wax and candles, valued at $80,106.

A large increase is shown in the production of natural gas in 1911, the total value being reported as $1,820,923, of which $96,665 was the production in Alberta and $1,724,258 in Ontario. These values represent as closely as can be ascertained the value received by the owners of the wells for gas produced and sold or used, and do not necessarily represent what the consumers have to pay for the gas since in many cases the gas is resold once or twice by pipe line companies before reaching the consumer.

The total quantity of gas used in Ontario was about 9,869 million feet, and in Alberta probably over 611 million feet.

The production of natural gas in 1910 was valued at $1,346,471 and represented about 7,952 million feet.

Cement.

Complete statistics have been received from the manufacturers of cement covering their production and shipments during the year 1911. These returns show that the total quantity of cement made during the year, including both Portland and slag cement, was 5,677,539 barrels, as compared with 4,396,282 barrels in 1910, an increase of 1,281,257 barrels, or 29 per cent.

The total quantity of Canadian Portland cement sold during the year was 5,635,950 barrels, as compared with 4,753,975 barrels in 1910, an increase of 881,975 barrels, or 18.5 per cent.

The total consumption of Portland cement in 1911, including Canadian and imported cement, and neglecting an export of Canadian cement, valued at $4,067, was 6,297,866 barrels, as compared with 5,103,285 barrels in 1910, or an increase of 1,194,581 barrels, or 23.4 per cent.

Detailed statistics of production during the past two years are shown as follows:

	1910. Barrels.	1911. Barrels.
Portland cement sold	4,753,975	5,635,950
Portland cement manufactured	4,396,282	5,677,539
Stock on hand January 1	1,189,731	844,741
Stock on hand December 31	832,038	903,590
Value of cement sold	$6,412,215	$7,571,299
Wages paid	1,409,715	$2,103,838
Men employed	2,220	3,010

The average price per barrel at the works in both 1910 and 1911 was $1.34, as compared with an average price of $1.31 in 1909 and $1.39 in 1908.

The imports of Portland cement during the twelve months ending December 31, 1911, were 2,316,707 cwt., valued at $834,879. This is equivalent to 661,916 barrels of 350 pounds at an average price per barrel of $1.26. The imports in 1910 were 349,310 barrels, valued at $468,046, or an average price per barrel of $1.34.

The imports from Great Britain during 1910 were 190,506 barrels, valued at $210,839; from the United States, 441,317 barrels, valued at $575,768; from Belgium, 2,683 barrels, valued at $2,019; from Hong Kong, 22,059 barrels, valued at $38,292; and from other countries, 5,351 barrels, valued at $7,962.

Following is an estimate of the Canadian consumption of Portland cement for the past five years:

Calendar Years.	Canadian. Barrels.	Per cent.	Imported. Barrels.	Per cent.	Total. Barrels.
1907	2,436,093	78	672,630	22	3,108,723
1908	2,665,289	85	469,049	15	3,134,338
1909	4,067,709	97	142,194	3	4,209,903
1910	4,753,975	93	349,310	7	5,103,285
1911	5,635,950	89.5	661,916	10.5	6,297,866

Annual Mineral Production in Canada Since 1886.

Year.	Value.	Value per Capita.	Year.	Value.	Value per Capita.
1886	$10,221,255	$2.23	1899	$49,234,005	$9.27
1887	10,321,331	2.23	1900	64,420,877	12.04
1888	12,518,894	2.67	1901	65,797,911	12.16
1889	14,013,113	2.96	1902	63,231,836	11.36
1890	16,763,353	3.50	1903	61,740,513	10.83
1891	18,976,616	3.92	1904	60,082,771	10.27
1892	16,623,415	3.39	1905	69,078,999	11.49
1893	20,035,082	4.04	1906	79,286,697	12.81
1894	19,931,158	3.98	1907	86,865,202	13.75
1895	20,505,917	4.05	1908	85,557,101	13.16
1896	22,474,256	4.38	1909	91,831,441	13.70
1897	28,485,023	5.49	1910	106,823,623	14.93
1898	38,412,431	7.32	1911	102,291,686	14.20

ADVANCED STATEMENT OF THE MINERAL PRODUCTION OF THE PROVINCE OF QUEBEC, DURING THE YEAR ENDING DEC. 31st, 1911.

(Figures are subject to revision).

From the items now at hand, received direct from the producers by the Mines Branch of the Province of Quebec, the total value of the products of our mines and quarries reached the very substantial figure of $8,567,143, during the year ending December 31st, 1911. This is an increase of $1,243,862, as compared with the previous year.

For the purpose of comparisons the value of the corresponding mineral products for the previous year, 1910, has been given in the last column of the table.

Product.	Production 1911. Quantity.	Value.	Value in 1910.
Asbestos, tons	99,352	$2,939,006	$2,667,829
Asbestic, tons	25,732	19,802	17,612
Copper and sulphur ore, tons	38,554	240,097	145,165
Gold, ozs.	590	11,800	.....
Silver, ozs.	23,000	11,500	.....
Bog iron ore, tons	931	4,041	4,406
Ochres, tons	3,612	28,174	33,185
Chromite, tons	197	2,469	3,734
Mica, tons.	.....	76,433	51,901

	Production 1911. Quantity	Value.	Value in 1910.
Phosphate, tons	558	5,595	3,182
Graphite, lbs.	753,405	33,588	15,896
Mineral waters, gals.	117,462	62,607	68,155
Titaniferous ores, tons	3,789	5,684	5,292
Slate	.....	8,248	18,492
Cement, bbls.	588,283	1,931,183	1,954,646
Magnesite, tons	885	6,416	2,160
Marble	.....	143,457	151,103
Flagstone	.....	500	890
Granite	.....	308,545	291,240
Lime, bush.	.....	284,334	279,306
Limestone	.....	1,081,059	503,173
Bricks, M.	130,297	1,135,501	906,375
Tiles, drain and sewer pipe, pottery, etc.	.....	100,000	197,526
Quartz, tons	500	1,125	2,013
Feldspar, tons	30	600	.....
Glass sand	.....	1,179	.....
Sand	.....	114,500	.....
Peat, tons	175	700	.....
Totals	.....	$8,567,143	$7,323,281

It is very gratifying to note that the producers are now responding much more readily to our requests for figures and information than formerly. And although the final figures which will be compiled in a month or six weeks from now, are expected to be slightly different from the figures given above, the variance will probably be much less than in previous years.

For the purpose of illustrating the growth of the mineral industry in the Province of Quebec, the following table is given:

Table Showing the Annual Value of the Mineral Production of the Province of Quebec since 1900.

Year.	Value.
1900	$2,546,076
1901	2,997,731
1902	2,985,463
1903	2,772,762
1904	3,023,568
1905	3,750,300
1906	5,019,932
1907	5,391,368
1908	5,458,998
1909	5,552,062
1910	7,323,281
1911	8,567,143

Asbestos.

Despite the unfavourable conditions under which the asbestos industry laboured during the year 1911, the shipments of this substance, from the producers to the consumers, show a substantial increase as compared with the previous year, 1910.

The average value per ton has somewhat decreased, from $33.09 in 1910, to $29.58 in 1911. This is due in a great measure to the over-production of the previous year, which glutted the market and caused a consequent fall in prices. On the whole, from the commercial and technical standpoints, the asbestos situation is satisfactory. Some producers may take exception to this statement, but on a close examination, it will be seen that many of the asbestos ventures, which are now closed down or are stagnating, should not have installed elaborate mining plants, and put up expensive mills without doing first a great deal more preliminary development work,—and ascertaining more thoroughly the workability of their deposits.

The applications and uses of asbestos are increasing year by year, but the absorbing power of the market is limited, and this must be taken into consideration by the producers.

As to the mines themselves, more especially those which produce a fair proportion of crude products, it can only be re-stated that they are in excellent shape, and the rock shows practically no change in depth.

The total shipments of asbestos in 1911 reached 99,352 tons, valued at $2,939,006. On December 31st, stocks on hand unsold were 31,420 tons, valued at $1,480,417.

For the year 1910, the figures were: Shipments, 80,605 tons, valued at $2,667,829. Stocks on hand on December 31st, 1910, amounted to 41,159 tons, valued at $1,921,923.

The shipments of asbestos made during the year 1911, according to grades, are as follows:

	Tons.	Value.
Crude Nos. 1 and 2	5,530	$778,549
Mill stock Nos. 1, 2 and 3	93,822	2,160,457
	99,352	$2,939,006

Copper and Sulphur Ores.

The marked increase in the production of copper and sulphur ore is owing to the shipments of the McDonald mine, from which over 2,000 tons a month are shipped. A great deal of systematic work has been done in this mine, which is giving very good results. The shipments of the Eustis Mining Company fell short of the previous year's, but the management took advantage of this comparative lull to do development work, and there is, at present, ore in sight for two years.

A small shipment was made from the old Ives mines near Eastman.

Gold and Silver.

The gold production recorded this year comes in part from the recovery of that metal from the treatment of the cupriferous pyrite ores of the Eastern Townships. The silver comes wholly from that same source.

But the greater part of the gold produced is the result of the resumption of work on the alluvial deposits of the Beauce gold fields. Owing to delays in installing the hydraulic washing plant, only a very short run was made at Beauceville by the "Compagnie des Champs d'Or Rigaud-Vaudreuil," but this was very satisfactory, and operations will be resumed with renewed activity as soon as the climatic conditions will allow.

Iron Ore.

The iron ore industry of the Province of Quebec has, in the last few years, shown a serious decline. The bog iron ore deposits of the St. Maurice district and of Drummond County seem to be passing away, and, so far, no other iron ore deposits have been brought into prominence to replace them. In 1911, only 931 tons of local ore were charged into the Drummondville furnace, of the Canadian Iron Corporation, the main supply of ore having had to be imported from Ontario. The Radnor furnace of the same company went out of blast in the summer of 1910 and was not blown in during 1911.

Titaniferous Iron Ores.

Some 3,789 tons of Titanic iron ore were shipped from the St. Urbain mines. This ore is used as an ore in Titanium, in the United States, in the manufacture of special rail steel, and also enters into the composition of special carbons for arc-lights.

Chrome.

No chrome mining was done during the year. The shipments were made from old stock piles.

Graphite.

The new mill of the Dominion Graphite Company, on the Stuart property near Buckingham started operations on July 1st, and substantial shipments have been made. Other producers of graphite, who have made returns of shipments are: The Bell Graphite Co., the North American Graphite Co. and the Peerless Graphite Co, all in Buckingham.

Mica.

The returns received from mica producers indicate a marked improvement in the state of the mica market. The better prices ruling have caused a renewal of mining activity and the shipments in 1911 have been 50 per cent. higher than in 1910. Mica is mainly mined in the valleys of the Gatineau and the Lievre Rivers.

Feldspar.

Only a few tons of very high grade feldspar were shipped from Moose Lake in Villeneuve Township by Messrs. O'Brien & Fowler, of Ottawa. This feldspar, which is valued at $20.00 a ton, is used exclusively in the manufacture of artificial teeth.

Sand.

The building sand which appears in the table for a value of $114,500 is specially coarse river sand, which is exploited by means of suction dredges, in the beds of certain streams which are under mining license from the Quebec Government for this substance. This sand is shipped to Montreal and other large centres where it finds a ready market for building purposes, more especially in reinforced concrete construction:

Other Building Materials.

A notable increase in the production of stone, brick and other structural materials is recorded this year. This increase, in a measure, is due to a more thorough collection of data and returns, but, nevertheless, it is sufficient to consider the development, the increase and the progress of the industries in general in the Province of Quebec, to realize that the market for structural materials has increased tremendously in the last few years and will continue to do so for many years to come.

MINERAL PRODUCTION OF ONTARIO, 1911.

Metallic.	Quantity.	Value.
Gold, oz.	2,153	$42,638
Silver, oz.	31,507,791	15,949,019
Cobalt in crude cobalt material, lbs	234,749	58,687
Cobalt oxide, cobalt nickel oxide, etc., lbs.	111,823	112,203
Nickel, tons	17,049	3,664,474
Copper, tons	8,966	1,281,118
Iron ore, tons	175,631	445,930
Pig iron, tons	526,610	7,716,314
		$29,270,383
Less Ont iron ore (67,631 tons) smelted into pig iron		172,391
		29,097,992

Non-Metallic.	Quantity.	Value.
Arsenic, lbs.	4,341,078	74,609
Brick, common, No.	316,000,092	2,480,177
Tile drain, No.	21,461,000	343,956
Brick, pressed, etc., No.	51,843,548	562,345
Brick, paving., No.	4,522,400	86,658
Building and crushed stone		882,667
Calcium carbide, tons	1,383	84,437
Cement, Portland, bbls.	2,943,003	3,563,995
Corundum, tons	1,471	147,158
Feldspar, tons	17,697	51,610
Fluorspar, tons	30	200
Graphite, tons	894	36,492
Gypsum, tons	20,335	32,535
Iron pyrites, tons	43,629	118,457
Lime, bush.	2,335,085	394,551
Mica, tons	322	43,058
Natural gas		2,068,429
Peat, tons	1,180	2,830
Petroleum, Imp. gals.	10,102,081	353,573
Phosphate, tons	20	240
Pottery		50,500
Quartz, tons	56,723	64,405
Salt, tons	88,689	430,835
Sewer pipe		410,064
Talc, tons	7,104	51,125
Total non-metallic production		12,334,906
Add net metallic production		29,097,992
Total production		$41,432,898

NOTES.

Metals.

Gold.—The greater part of the production came from Porcupine, being derived from the small test mills at two or three properties. The fire destroyed these mills and thus caused the output to be smaller than it otherwise would have been. The two or three large mills that were in course of construction were also destroyed. The new mills at the Dome and Hollinger mines are nearing completion and will be in operation about the end of the first quarter of the year. The branch of the Ontario Government Railway, the Temiskaming and Northern Ontario, is now in operation to South Porcupine, and is almost completed to the townsite of Timmins. The plant of the Canadian Exploration Company at Long Lake, near the Sault branch of the Canadian Pacific Railway, is nearly completed. As soon as electric power is available the mill will begin operations. Toward the end of the year, the St. Anthony mine at Sturgeon Lake, northwest of Port Arthur, was unwatered, and milling of ore has begun. The Belmont or Cordova mine, in Hastings County, has, after being idle a number of years, begun operations under new owners. There was a small production of gold from seven or eight mines, in addition to those mentioned, in other parts of Northern and Northwestern Ontario.

Silver.—The entire production came from the mines of Cobalt and surrounding region. The output in 1911 was 31,507,791 ounces, this being the greatest annual production since the beginning of mining at Cobalt, exceeding the production of 1910 by approximately one million ounces. The shipments of bullion from Cobalt increased greatly during the past year, owing chiefly to the operations of the refinery of the Nipissing mine. The process employed by that company is

somewhat unique, being a combination of amalgamation and cyanidation. There was a shortage of power during the early part of the year owing to an accident to one of the large plants. The power situation has since been satisfactory. The extension of the concentration process has brought about a change in the character of the shipments. Instead of much low grade ore being shipped from Cobalt, the shipments now embrace a large quantity of high grade concentrates. That silver is produced at a very low cost at Cobalt is shown by the last annual report of one of the companies, the Coniagas, which produced metal throughout the year at an average total cost of 8.8 cents an ounce, including mining, concentrating, freight to smelter, sampling, assaying, and treatment charges and all head office expenses and royalties.

At Cobalt in 1911 there were seven mines which each produced 1,500,000 ounces or more of silver. In order of production they are as follows: Nipissing, 4,627,043; La Rose, 4,090,157; Crown Reserve, 3,430,902; Coniagas, 3,273,464; McKinley-Darragh, 2,551,884; Kerr Lake, 2,238,353. Buffalo, 1,644,245. Three other mines produced over a million ounces each.

Two properties at Gowganda were producers during the year, as were also two in South Lorrain.

Refineries at Copper Cliff, Deloro, Thorold and Orillia continue to treat the greater proportion of the high grade ore shipped from Cobalt.

The dividends paid by the companies operating at Cobalt and in South Lorrain in 1911 amounted to $8,588,916, or over one-half of the total value of the silver produced. The total dividends distributed up to the end of 1911 amounted to $30,391,095, not including profits made by two or three privately owned mines or close corporations. For the whole period since the mines were opened at Cobalt, there has been produced from this part of Ontario 125,571,980 ounces of silver, which brought the mine owners $64,317,352.

Cobalt.—The quantity of cobalt in crude material shown in the table is only that part of the output for which mining companies were paid by purchasers of ore. A much larger quantity was shipped out, but, for the most part, brought no returns. The table also shows the quantity and value of cobalt oxide, cobalt nickel oxides, and other cobalt-holding material shipped by the refineries of the Province. The market for cobalt oxide continues depressed.

Nickel.—The nickel mines and smelters in the vicinity of Sudbury had a smaller output in 1911 than in 1910. Toward the end of the year, however, the output was increased, and the two operating companies are preparing to still further increase it. The Mond Nickel Company is arranging for the erection of a plant with increased capacity at Coniston, east of Sudbury, at the junction of the Canadian Northern with the Canadian Pacific Railway.

The nickel contents of the silver-cobalt ores, which yield nothing to the mine owners, are not here included in the output of nickel.

Copper.—The copper produced in Ontario last year came from the nickel-copper mines at Sudbury. The two metals, copper and nickel, occurring together, the output of the former rises and falls with that of the latter. In 1910 the production of copper was 9,630 tons, in matte. In 1911 is was 8,966 tons. The price of the copper in the table of statistics, like that of the nickel, is based on its value in the matte and not on its refined value.

Iron Ore and Pig Iron.—In 1911, all the hematite shipped came from the Helen mine of the Lake Superior Power Company. The quantity was 137,377 tons, an increase over the shipments of 1910, which amounted to 112,246 tons. Three other mines shipped a total of 38,254 tons of magnetite.

The 526,610 tons of pig iron produced came from the following companies, viz.: Hamilton Steel and Iron Company, Atikokan Iron Company, Standard Chemical Company, Canada Iron Corporation, and the Algoma Steel Company. The Hamilton Steel and Iron Company and the Algoma Steel Company were also producers of steel. Of the ore smelted, 67,631 tons were of domestic and 848,814 of foreign origin.

Discoveries of metals, not hitherto found in economic quantities in the Province, include mercury and tungsten. The former metal occurs in the silver-bearing Cobalt ores, and the latter in the mineral scheelite, in certain gold-bearing quartz veins at Porcupine.

Non-Metals.

Building materials.—The value of the building materials, such as brick and Portland cement, produced in 1911 shows a material increase over that of 1910. There is an increasing demand for suitable stone for road-making, and arrangements are being made for opening quarries to supply the needs of the older part of the Province. Marble from the quarries near Bancroft, in Hastings County, is being employed for the decoration of the interior of buildings.

Petroleum.—The production of petroleum continues to decline. The output during 1911 amounted to 10,102,081 Imperial gallons, as compared with 11,004,357 in 1910.

Natural Gas.—In contrast to petroleum, natural gas shows an increased production year by year. In 1911 natural gas from Ontario wells had a value of $2,068,429, while in 1910 its value was $1,490,334, and in 1909 considerably less, $1,188,179.

By counties, the new producing wells of 1911 are distributed as follows, viz. Welland 26, Haldimand 124, Brant 60, Norfolk 19, Wentworth 9, and Elgin 16.

Minor Products.—Among the products of lesser value, calcium carbide shows a decrease in 1911, as compared with the preceding year. This is due to the absorption of Ontario plants by an extra-provincial company and the closing or partial closing down of the works during a part of the year. Talc shows a considerable increase in quantity and value of output, as does iron pyrites. Another acid plant, which will use pyrites as a raw material, was erected in the Province during 1911. There are a number of industries, which, owing to abundance of raw material, are capable of great expansion. These include gypsum and salt, both of which show an increased output during the past year.

Ontario's mineral industry is characterized by the variety and uniqueness of its products. Moreover, it is characterized by rapid increase in the value of annual output during recent years, and it offers great scope for increase in the future.

THE IDOL OF QUICK RETURNS

(An address delivered by D. H. Browne at the annual dinner of the Engineering Society, School of Mining, Kingston.)

There are here at Queen's University some 1,200 students, who have come here to spend from four to six years of their life in the pursuit of some definite object. These students will each spend, perhaps, five hundred dollars a year, in railway fares, college fees and living expenses, which means that about $600,000 a year is expended by these young men and women. In addition to this they have during this time surrendered their earning power and become non-producers. We will assume that during eight months of the year these young people are idle, and that their earning capacity is $50.00 a month. This amounts to a monetary loss of at least $400,000 a year. So that I am quite within the bounds of reason when I say that it costs these students at least one million dollars a year to maintain their attendance at this university.

Now, why do they do this? No one pays out money, no one devotes his time, his labour, his ambition in this way without hope of recompense. Ask these boys and girls, and they will answer that they do this in order to be successful in life. Success in life—this means two things, greater earning ability and greater enjoyment capability. The end of life is happiness. Happiness is not mere Hedonism, not the simple pursuit of pleasure for the sake of pleasure. Happiness means the attainment of man's best, highest, noblest desires. We seek for riches, not for the sake of money alone, but for what we can do therewith to further our physical, mental and spiritual welfare. I take it that these students are here at Queen's in order to gain two things, first, the ability to attain a higher position in life, and, second, the capability to enjoy that position when they have attained it.

The first proposition is, then, that these students came here with the idea that when they leave college they will be able to earn more and to fill higher positions than if they had never attended college. Is this correct?

I have here in my hand a pamphlet written by R. T. Crane, President of the Crane Co., of Chicago, which is entitled, "The Futility of Technical Schools in Connection with Mechanics and Manufacturing or Electrical and Civil Engineering." This pamphlet and several others along the same line have been widely circulated. They contain a very violent attack upon the technical schools of the United States, and while the Canadian schools are not mentioned, Mr. Crane's arguments are perfectly applicable on this side of the border. It seems to me that these ideas are false, illogical, and dangerous, but in order to show why I thus deny them, it is necessary first to state Mr. Crane's ideas in order.

"Importance of Starting Out in Life Right."

The question whether one is starting out in life right is decidedly the most important that ever arises with any person. I therefore urge you, before you go any further, to stop, look and listen. No boy or man in these days can afford to throw away eight of the most important years of his life in acquiring a schooling that will be of little or no use to him. My experience convinces me that the boy who went into the factory or field to learn some business when you entered high school has a tremendous advantage over you, and that you never will be able to make up this loss of time and money.

Most people who have been successful owe their success largely to a right start. Of course, they had natural ability to help them, but it may be said safely that if they had started differently they would not have succeeded so well. On the other hand, if a great many who have failed had begun right, it would have been greatly to their advantage. This matter of a right beginning has not been given the consideration it deserves, but has been left largely to chance.

"Why Are You Here?"

You are starting out with the belief that a large amount of technical school training will be of use to you—in fact, that it is indispensable; hence you are here. But if I were to ask you for some sound or logical reason for being here, you would find it difficult, probably, to give any. It is my opinion that you are here for some of the following reasons:

First, because of the popular feeling that these technical schools possess great merit, which feeling seems to be magnified by the growth of these institutions. Later you will see that this popularity exists simply among people who have little knowledge of the subject, and that these schools are promoted by educators because the great mass of the unthinking public has faith in them, thus affording these educators opportunity to humbug you and the public by multiplying them, all of which is a part of the whole higher educational scheme to fleece you and the public.

Secondly: Another way in which you are deceived is through the claims which the heads of these schools are making that a great many prominent employers favour their students and seek them for their business. Some of them go so far as to say that these employers are clamouring for you boys, and thus make it appear that your schooling is going to be of great value to you, which I shall show you is another fraud.

Thirdly: Another reason why some of you are here is because of the silly talk that is being indulged in by a few impractical men in business who are taking the ground that the technically school trained boys are superior to those who have had a practical training only, and that in their business they are giving preference to the former. I shall show you that these people are in a very small minority.

Fourthly: I think that the fascination which the word "engineer" possesses affects you, since it seems to be so much more dignified than "foundry man" or "plumber."

When we sum up the reasons for your being in a school of this kind we find that not one has a sound, substantial foundation, so that, as a matter of fact, you are here simply through the grossest deception. I challenge the heads of these institutions, or any business man who pretends to give preference to boys

trained as you are being, to show any substantial results of such training.

"Mechanics and Manufacturing."

Let us first look into the question of the utility of technical schools in connection with general mechanics or manufacturing. In considering such a question, theories, guesses, or the individual opinions of persons who have not given it any serious thought, or who are in the higher schooling business for money purposes, are of little or no value. What you want are facts or the preponderance of evidence from men of judgment who are in a position to have sound ideas on the subject, who have given it some thought, who are free from prejudice and have no selfish interest in these schools. Now, here are some of the facts:

"Facts."

First: Comparing this country to-day with fifty years ago, it has gone to the greatest extreme in all kinds of technical schooling. In the United States to-day there are 129 technical institutions, including universities, that have a special department devoted to this branch of schooling, and the number of students taking this course of study is about 30,000, which in all probability means that about 10,000 boys are leaving these schools each year. From this we see that there would have to be an enormous demand in order to provide places for this large number of young men supposed to be trained for the higher and better positions.

Secondly: It is also a well-known fact that this country was immensely successful before the technical schools were established.

Thirdly: Notwithstanding many educators are trying to make us believe that this country is going to destruction through dry rot and that the only means of saving it is through their schools, the fact is that no country on the face of the earth to-day is more prosperous or stands so high in everything in which technical schools are pretending to aid us as the United States.

Fourthly: All the heads of these technical schools, as well as all employers who claim to favour boys from such schools, admit that before such boys can be of any value in any line of business they must have a large amount of practical training.

Fifthly: Although tens of thousands of technically school trained men have been coming from these institutions, this class of men are doing little or nothing to contribute to the real prosperity of the country, and if you should go through our great industrial institutions you would find little trace of them in any important positions; probably not in one per cent.

"Importance of Experience."

What a manufacturer wants is not a man of theory, but a man of brains who has had an immense amount of experience, who knows the state of the art thoroughly, and who understands all kinds of tools and what they are capable of doing. This is the only kind of a man that is of any account in a manufacturing business. Hence we regard these schools as absolute failures so far as being a help to general manufacturing and industrial business is concerned, and, therefore, it is not necessary to discuss this feature of technical school work."

Mr. Crane then goes on to show that a graduate of a technical school will go to work for the General Electric Co. for two years in the testing department at 20c. an hour, and will then spend two years more in the engineering department at 27½c. an hour. This brings the boys to 27 years of age, at which time, as he says, they will be very lucky if they can go out and secure a job at $3.00 a day. Mr. Crane's remedy for this is given in his pamphlet, under the caption:

"Common Sense Method of Making Electrical Engineers."

The common sense way to make electrical engineers is as follows: Select, with the greatest care, boys about 16 or 17 years of age for machine shop apprentices. Watch over them carefully, in the first instance, to see that they are what the employers are seeking as material for good machinists. If the foremen who keep a close eye on the boys discover that some of them have unusual ability, let such be put in the line of direct training for electrical engineering. Such boys, after having two years of training in the machine shop (say, one year at bench work and a year at tool work), shifting around considerably, would get the knowledge of that part of the work which is required to make of them good electrical engineers. Then let them spend six months in the testing department, six months drafting, a year in the erecting department, and a year in the operating department.

While working in this way they are surrounded constantly by an electrical atmosphere and will absorb, through observation and association, nine-tenths of all the knowledge they will need to have regarding electricity, and all this will have a splendid influence over them. The grandeur of the work is particularly inspiring, and the absorbing of all this information takes none of their time, as it is done unconsciously.

During this period the boys could attend night school as much as is necessary and be furnished books on the science of different lines of electrical apparatus, books containing only such things as the best practical men know to be essential. If necessary, lectures could be given advantageously by the company's own engineers who know decidedly better what these boys require than any school teacher could possibly know. This would make five years in all, and then you would have a young man who, at 21 or 22 years of age, would be a fairly good electrical engineer. Such a man is likely to make his mark and certainly should be of considerable value to any one requiring his services. Besides this he would have been earning his living all this time."

Mr. Crane concludes by accusing the college authorities of sharp practice.

"College Authorities Sharp-Practice Men."

"As you grow older you will discover that there are many kinds of sharp-practice men, each of whom has his own way of bleeding and defrauding the people in order to make his money, that is, to steal your money. The man who picks your pocket, the man who robs you, the burglar who enters your house, or the trusts who are mulcting you on every side are all decidedly vicious, but they are insignificant thieves compared with the man who induces you to spend your money and eight or ten of the best years of your life in acquiring something that will be of little or no value to you. You can overcome, perhaps, the loss of money which these things have robbed you of, but you cannot afford to be robbed of the years which should be employed in laying the foundation of your future career by which you can support yourself and family.

"In Conclusion."

Criticisms upon my method of dealing with this subject have been made, and there comes to me a recent instance of a young man of fine character and excellent home training, who, in an unguarded moment, while in the employment of the post office department in Chicago, took one dollar from a letter, and was sent to the penitentiary for one year. If it was justice to punish this young man by committing him to the penitentiary for his act, what should be done to the people who are using every possible effort to induce boys to spend eight of the best unfolding years of their lives in securing a training which will be of no pratical value to them in later years. Therefore, I have no apology to offer for what any one may call the harshness of my views."

Now Mr. Crane's attack is directed against American technical schools, but it is reasonable to suppose that his arguments are equally applicable to those on this side of the border. There are, however, some important points in which our Canadian schools differ from the American. It is customary in the States to carry a course of nine months, even in some cases of eleven months' work. On this side our custom is to limit the class work to a period of six or seven months, and to allow the boys to spend three or four months of each year at practical work, in the mine, smelter or shop, according to whatever branch of scientific work they intend to make a specialty of. It has been my privilege at the smelter at Copper Cliff to hire a large number of Canadian students during the summer months. The majority of these are hard-working, diligent, intelligent men, keen to grasp a new situation, and manly enough to accept the discomforts incident to the work in a cheerful way. We are glad to have them there. Those who make good are always welcome again. Of course, as in any other body of men, there are a few goats. I have had a student come to me after a week's work around the furnace and ask for his time, giving as his reason that he wanted to get away, as he had learned all there was about the work, except the details. He got his time.

But the vast majority of Canadian boys are manly and self-reliant. My only regret is that more of them do not stay with us. Like all other commercial enterprises I know of, we are always hard pushed to find among our men some men of intelligence and experience to make foremen. I can assure you that such men are hard to find. Many times we have had to put in responsible positions men who were none too well qualified for these positions, simply because no others were available. What we and many other firms need is bright young men who will remain in our employment, even if their present positions are not exactly to their liking, until we have had time to move them from one department to another in order that they may get a broad experience in their work. But frequently the very man we have talked over and planned to move into some more responsible position gets another opportunity offered him elsewhere, and when we want him, he is gone. This fact, which I wish to emphasize, shows very clearly that the demand for such intelligent work as these boys give is greater than the supply. This fact disposes in very large measure of Mr. Crane's argument that the technical schools turn out a lot of young men who are worthless to their employers, and who can not obtain responsible positions. But Mr. Crane goes on, "these technical school men are not fully trained craftsmen, they are not competent along any one line. They come out of college and have to compete with the uneducated labourer, who by sheer dint of sticking to one line of work has mastered that line, and is receiving good wages." This is very true. Take a college boy who, after studying, say, electrical engineering, goes into the shops at Peterboro. He finds there men who can do the work he is put at far better than he can, men who know nothing but this particular work. These are his competitors. He has to accept their wage rate, and pit his brains against their experience. He is at a disadvantage for a time. If he considers his present condition only, he may regret that he had not followed Crane's advice, which you will remember was to omit the technical school course, go directly into a shop, and spend four years of practical training at one line of work.

Now, all I say to this is that if a boy desires to become a highly efficient machine, this is certainly the best way to go about it. The modern shop is always in advance of the technical school; the surrounding influences are all in one direction, and a young man thus spending six years of his life is undoubtedly a better craftsman, and can immediately earn higher wages than one who has spent four or six years in a university.

We will admit once for all that there are some subjects which a university or technical school can not teach, does not attempt to teach, and should not be expected to teach. A university does not aim to make machines, but to make men. It does not take a boy and perfect him along one narrow line. It aims to lay broad foundations, to inculcate principles, to train in culture, to foster a taste for all that makes life livable and men and women lovable.

Take this technical school at Kingston, for example. If a boy wishes to become a mine foreman, or a smelter man, or an expert winder of commutators, he will never get that training here. Any of his professors would advise him to go into the mines at Granby, or the smelter at Copper Cliff, or into the General Electric works at Peterboro. In four or five years he would be a skilled craftsman, he would earn three or four dollars a day, he might even be in charge of some commercial enterprise—but that is all. He would be successful as he measures success—but what a price to pay for such a limited success! Like Selkirk on Juan Fernandez, he is monarch of all he surveys, but how far can he survey, how limited his horizon!

Many, many generations have gone by since the preacher said, "Where there is no vision the people perish"—where there is no vision, no broad outlook on life, no scope for larger ambitions. What phrase could better describe the condition of one who spends his best years in mere striving to learn a craft whereby to earn his daily bread. This is all a training such as Mr. Crane proposes can give, the certainty of daily employment. Is this then all we are to strive for? Is the training we get here simply a meal ticket? I claim that life is more than this. Man cannot live by bread alone. Remember that happiness arises not merely from greater earning power, but from greater capacity for enjoyment.

There are schools, exactly such as Mr. Crane describes, where a man can learn to be a telegraph operator, or a stenographer, a watchmaker, or a barber, and at the end of his training course he comes out a brisk useful craftsman, needing only practice to

make him perfect. But what profiteth it a man if he gain the whole world and lose his capacity for enjoyment? Wherein is he a gainer if he can earn a living, and his life is not worth living? He can wind a commutator, but he has never heard of Franklin or Faraday. He can cut stone or mix paints, but is blind to the smile of the Venus of Milo or the grace of the Sistine Madonna. He can tune a piano, but is deaf to the pathos of Beethoven and the pious exaltation of Handel. He can survey a wilderness into town lots, but has never lifted his thoughts to the Pleiades and the flashing belt of Orion. He has mastered the books of the Scranton Correspondence School, and has never heard of the madness of Hamlet, or the troubles of Tristram Shandy. He can work for a party victory in his own riding, and knows not that his liberty to vote was won by Pym and Hampden and William the Silent and Stephen Langton. He is living by bread alone. He has no vision, he cannot see the world as a whole, he has bartered his birth-right for a mess of pottage, and sold his manhood for a meal ticket.

You are taught many things which may appear to you dry, tedious, irrelevant, uninteresting. Never mind that. You will forget more than you will remember. But always remember this, it isn't the water that stays in the fleece that scours it, it's the water that goes through the fleece. It isn't always what you remember that does you most good, it is the act of grasping new ideas, of fixing the attention, of facing novel problems, of training your brain to act quickly in emergencies. These studies you grind out here are useful, not solely for what you remember of them, but for what they suggest to you.

Mathematics is not, as the Beloved Vagabond says, a lot of damned facts about triangles; it is the plan on which the Creator fashioned the universe. Chemistry and Biology are not the mere study of reactions and adaptations; they are the keys to all life, past and present. Mining and Metallurgy are not hand-crafts; they are the factors that open new continents and change the map of the world. French and English are not simply languages in which to call for another wheel-barrow of concrete; they are the open doors to the literature and history the wisdom and pathos, the wit and humour of a thousand years

All this broad outlook on life is summed up in one word—Culture. No one can give you this, but every college gives you an excellent opportunity to attain it. Culture, friendship, inspiration—these are three things that make life worth living, three things which are here for you to grasp and take with you. Culture, as I have said, comes from the study of broad principles and can never be attained by undivided attention to one narrow subject. Here in these halls, among these libraries and museums, you have the chance to attain it. Friendship, the good-will and affection of your fellows is here also for you. You cannot dig this out of dead books. Here around you are young men who may be leaders of the future. Learn to know them, find out the best that is in them, be loyal to them, for as the Norse proverb says, "Back is bare without brother behind it." The loyalty you give to the captain on the campus is the same loyalty that has made Canada a great country, and some day will make it, in name as well as in fact, a great self-governed, self-centred nation.

Culture, friendship and inspiration, these three, and the greatest of these is inspiration. This is the one thing which all the others lead to, for this is the true vision. Inspiration means the inbreathing of a great spirit, the breath of life in man's nostrils. We cannot define it, we cannot analyze it, we can only feel it, as we feel a chord in music. It comes from the consciousness of the presence of the migthy dead, who have moulded the nation, it comes from the companionship of noble men and women living around us, from the memories with which the college halls are hallowed. You know the feeling that comes over you in a close-packed crowd when the leader rises, and you see the tense upturned faces around you and hear the quick intake of breath, as the truth he speaks sinks home. You picture the gaunt figure of Lincoln at the National Cemetery and the hushed audience that hangs on his words as he gives them the greatest speech ever made in the English language, the matchless Gettysburg address. They turn away too deeply moved to applaud, too much uplifted to cheer, because they have received the inspiration, they have seen the vision.

There has been in every college some man around whom the highest and noblest ideas have crystallized, men that have moulded the nation; such men are our greatest inspirations. Such men as Arnold of Rugby, Elliot of Harvard, Wilson of Princeton, Angell of Michigan, and fit companion of the greatest, Grant of Queen's—these are the men who have made us men. Can any narrow course of training such as Mr. Crane desires give us anything for which we would exchange these memories? Never. Man cannot live by bread alone.

You will go from here in a few years, less skilled, perhaps, in the profession you enter than many a trained apprentice, you may earn less for a few years than if you had never come here, you will have your struggles as we have all had; but when you do attain your ideals you will have brought with you a greater capacity for enjoyment, a broader outlook on life, a nobler patriotism, and a higher ideal than if you had never spent these years at Queen's, for you will take with you somewhat of these three, culture, friendship, inspiration, to broaden and brighten your life, and you will have glimpsed the vision without which the people perish.

MARBLE BAY AND BRITANNIA MINES, BRITISH COLUMBIA.

At the general meeting of members of the Western Branch of the Canadian Mining Institute, held in Vancouver, B.C., on February 15-16, Mr. W. M. Brewer, of Victoria, B.C., gave a brief account of the Marble Bay and Britannia copper mines. He said:

"It is my desire to say something about some of the metalliferous mining properties situated within a comparatively short distance of Vancouver. Too little has been said concerning the mineral resources tributary to Vancouver. We want people to know what is going on close to their own doors, so to speak. There are two mining properties in this district with which I am acquainted, and of these I will tell you something.

The Marble Bay Mine.

"First, there is a little property over on Texada Island, known as the Marble Bay mine. It is only

small mine, but it has the distinction of being the only mine in this district that has been operated practically without interruption since 1898, and that has been producing pay-ore continuously since 1899. This mine has paid for all of its development work out of proceeds of its ore, and, too, has paid dividends since 1902. It is interesting to know that this mine is now being worked down to a depth of 1,360 feet, and that the ore continues to be at depth of uniformly good grade. In fact, this mine was a sufficiently large producer last year, together with the Britannia, to in some measure offset, in the total production of the Province, some of the decreases in production in other mining districts.

"I remember having visited the property in the fall of 1900, in company with Mr. Palmer, then one of the owners. The shaft at that time was down 140 feet, and the owners were considering the desirability of quitting, thinking the ore was worked out. We advised them to sink deeper, so the shaft was sunk another 100 feet. The result was that Palmer and Christie, of Toronto, took out about $65,000 worth of ore, and later sold the property to the Tacoma Steel Company for $150,000. The new purchasers did not have to put up much money, for they were given three years in which to make the payments on purchase account, and they provided for these payments out of proceeds of ore they took from the mine. They had money from ore-shipment returns to meet their payrolls and they never afterwards had to put up a single dollar for working expenses, except, perhaps, when they deepened the shaft to the 1,000-foot level.

[Note.—Shipments from this mine in 1911 totalled about 22,500 tons of ore averaging 5 per cent. copper and fair value in gold and silver.]

The Britannia Mine.

"The second property to which I will call your attention is the Britannia, on Howe Sound, within about three hours' steamer run of Vancouver. This property was located in 1898, and was afterwards sold to Mr. Leo Boscowitz for $10,000. In the fall of 1899, Mr. Boscowitz sold a seven-tenth interest in the property for $35,000. Five years later he sold his remaining three-tenths interest to George Robinson and Harry Stern of New York for $125,000.

"Robinson and Stern put up a big concentrating plant, but before they ever shipped a ton of ore the shares of original stock, issued at $125, were selling at $2,100. Everything went along satisfactorily, and at last Robinson sold his control to Moore and Schley, of New York. Last year the general manager, Mr. Robert H. Leach blocked out 400,000 tons of ore, and the mine is now shipping ore at a profit of $50,000 a month.

"These two instances of mines in our own vicinity show that with perseverance and a proper expenditure of capital, it is possible to achieve very good results."

[Note.—Mr. E. Jacobs, correspondent in British Columbia for The Canadian Mining Journal, adds to the foregoing the following information: A statement made to me last November by a man familiar with operations at the Britannia during 1911 was to the effect that it was estimated fully 1,000,000 tons or ore of commercial grade was in sight in the mines of the Britannia group. Last month I learned from another source that about 700 men were then employed on the property, some in doing development work, others in mining and milling ore, and still others at construction. The question of whether the Britannia shall in future be worked as a big low-grade mine, or as one from which only the higher-grade ore shall be extracted, is an important one. If the owners shall decide to work it as a big low-grade mine, and mine and smelt all the ore upon which even a small margin of profit will be obtainable, then it will become a much more important mining enterprise than if only the better-grade ore be extracted and the poorer ore left. There are immense bodies of ore in the mines of this group, and their utilization on a large scale will probably involve the erection and equipment of smelting works at Britannia Beach, and the employment of from 800 to 1,000 men constantly. In any case, the doubling of the generating capacity of the hydro-electric power plant, and the provision of additional transportation facilities from mine down to Britannia Beach, are likely to soon be undertaken. In the year 1911 there was mined and concentrated more than 100,000 tons of ore containing between 8,000,000 and 9,000,000 lbs. of copper.]

SAVED BY THE MINE TELEPHONE.

The public at large has already for some time past appreciated what great reason they have to be grateful for the invention of the telephone; but there are to-day two miners in Kansas who are more than grateful. They owe their lives to it.

These two miners, or "shot-firers," to be exact, are employed by the Girard Coal Company in a mine at Radley, Kansas. The mines of this company have recently all been equipped with Western Electric Company mine telephones, and, according to the rules of the Coal Company, the shot-firers must report to the night engineer, by means of the telephone, the progress of their work as they go through the mine lighting the shots. This enables the engineer to know where his men are, so that if he does not hear from them at certain intervals, a rescue party is sent down.

One evening after the miners had left, the shot-firers went down as usual to fire the shots which would bring down the coal for removal during the next day. The two men had just entered a refuge hole and one was in the act of ringing the engineer to tell him they had lighted the shots in that particular entry, when an explosion occurred. The force of the explosion was so strong that it blew in the back end of the refuge hole, and the shot-firer did not even get to talk, but was immediately overcome by the after-damp. His partner, who was with him, was likewise overcome. The night engineer, knowing that this was the station from which they should next report, immediately tried to call them, but was unable to get any response, started the distress whistle. In fifteen minutes after the explosion had occurred a rescue party was in this refuge hole and had the two shot-firers out working upon them and succeeded in resuscitating them. A little later it would undoubtedly have been impossible to revive them.

There is an employers' liability law in some States which compels the operator to pay a considerable sum for loss of life or personal injury. The fact that the telephone very often prevents accidents and assists in quick rescue work, saves the operator a great amount of money. In the Girard Company's mines there were three severe explosions during the winter, but not one of the Western Electric mine telephones was injured, nor was service interrupted.

CORRESPONDENCE

MR. J. G. S. HUDSON'S REPORT ON THE BELLEVUE DISASTER.

Editor Canadian Mining Journal:

Sir,—As my name is mentioned in this report and Mr. R. W. Coulthard has contributed an article to the February 1st edition of The Canadian Mining Journal, I beg to submit a few notes to encourage discussion on the subject generally and on mine rescue business in particular.

Cause of the Disaster.

Under this heading Mr. Hudson has made some mistakes, which might have been avoided if he had examined the inside of the mine for himself, instead of depending implicitly on information given to him by various people who may have been in the mine.

On page 152, he agrees with others, that the destructive "zone" of what he calls the "explosion" was at 75 or 76 chute, and that the proof of an "explosion" was demonstrated by the "large amount of carbon mon-oxide gas and afterdamp encountered by the exploration party, in this section of the main gangway, and also that three of the four bodies recovered between 53 and 54 were burnt."

No evidence was given at the inquest that there was a large amount of carbon mon-oxide and afterdamp present, neither was there any evidence given that "any" bodies were "burnt," anywhere in the mine, and certainly not between 53 and 54 chutes.

To take the evidence of burning first: Two out of the four men who were packing a stick of timber along the fourth cross pitch, between 52 and 46, had burns on their faces on one side only, and only one of these two had both hands burned. The evidence was that these burns were from the heat of the floor where they were lying, and not from gas burns. No singeing of the hair, whiskers or moustaches, was in evidence. The peculiarity of these burns has not yet been explained. As some aid to those who may take part in a discussion on this subject, it may be noted, that these four men were carrying a piece of timber when the disaster overtook them, and were probably passing a cut through to the level above, as one man was buried by the debris blown down it, and his body showed marks of the force with which particles of coal were carried along. But his body was absolutely free from burns of any kind, and one of the other men was also equally free from burns. The man found close to the top of 52 chute was the one who had his cheek roasted where it rested on the floor and both his hands burnt. the fourth man also had one cheek roasted where it rested on the floor. The debris on this level, also in 52 chute, was found to be hot when the bodies were recovered. As an indication of the force which may have been exerted in this fourth cross pitch, it may be noted that in the previous disaster of the 31st of October this cross pitch driving from No. 52, was not cut through to the cross pitch driving from 46, but the force blew out the rock strata, of about 3 feet thick, which separated the headings. In this part of the mine the coal had doubled in thickness and was separated by the rock which was blown out and the headings or levels had just overlapped.

This demonstration of hot debris on the floor, was also in evidence in No. 82 chute, from between the 2nd and 4th crosscuts, after both the October 31st and December 9th disasters. On the first occasion it was thought to be a "gob fire," and on the second occasion Heal, one of the miners, tried to escape up No. 82 and out at the upcast shaft, but turned back because the floor was so hot that he could not bear his hand on it, and also because there was a large fall of roof. This fact also nullifies Mr. Hudson's assertion, on page 154, that there was only one way of exit and that that was along the main haulage road. Further than that there was a travelling way out of the mine through No. 45 chute. This is sufficient to show that there was no justification for saying that no one "made the slightest attempt to escape from the mine by travelling up the chutes."

Mr. Hudson then goes on to give his theory of the disaster, but the writer thinks that it was an inopportune time to put his reasons in print after the enquiry was closed. He ought to have brought it forward at the time of the inquest, when he might have assisted the jury, and, at the same time, given the interested parties an opportunity of examining him on the correctness or otherwise of his deductions. The writer, in his theory that the effects produced throughout the mine were due to "air percussion caused by a very heavy fall of roof," receives considerable support from Mr. Hudson's argument, viz., that "the heat generated by the friction and concussion of rocks raised the temperature of the air and gas to a high point, so that it would require only a spark of comparatively low thermal intensity to reach the ignition point of a small volume of hot explosive gas."—"the air was in sluggish condition, consequently, when the explosion occurred, would give out a large volume of carbon mon-oxide gas without large demonstration of force." Mr. Hudson says, "without a large demonstration of explosive force." What he infers from this it would be difficult to guess, after reading what he says Brownrigg told him (see pages 147-148), and also taking into account that two men were killed by violence outbye of No. 45 chute on the main gangway or haulage road.

Volume of Carbon Mon-oxide Gas or Afterdamp.

The writer differs from Mr. Hudson's conclusions on this point entirely, as everything found after the disaster tended to show that the volume or percentage of either carbon mon-oxide or afterdamp was extremely small. Thus the men, even those who were found dead, wandered about the roadway for a long time before a portion of them succumbed, and even these would have survived if the air compressing engines had been kept going; further than that the group of men who were found alive at the far end of the main gangway at 124 chute, were there for four hours without any ventilation whatever, and it was not until the lapse of this four hours that the high pressure air was sent into the mine, and eventually kept these men in safety.

The writer would like to know from Mr. Hudson, where the gas came from which he assumes was "exploded." Did it come down with the fall of rock or does he assume it was already standing there ready to be ignited? The only evidence that was brought forward at the inquest with regard to gas (firedamp),

suggested that it was far higher up in the mine, and this in a mine rising from 45 to 80 degrees, and vertical in some places. Then again it must be borne in mind, that the pillars between 70-71 were intact with stopings in the cut-throughs, and that it is quite clear that Mr. Hudson's theory needs a great deal ofelaboration, before it can be accepted as in any way accounting for the demonstrated results of the disaster.

The writer would also like to ask Mr. Hudson if he examined under the microscope any of the dust which he calls "coked," and, further, he would like to ask, either Mr. Hudson or anyone else, what is the lowest heat which will cause tar to exude from such a coal, sufficiently to cause it to cohere in places?

He would also like to remind Mr. Hudson, that the majority of the dust had been exposed to two "effects," that is, on the 31st October and the 9th of December, and that after the latter disaster the witnesses said the mine was very dusty.

The writer would further like to know if it would surprise Mr. Hudson to learn that the loss of two lives was entirely due to some persons opening the main doors in the gangway, and thus cutting off the air from the rescue party. This allowed gas to come down into the roadway from the unventilated workings evtending from No. 82 to 129. At the time of the inquest the wriier was unable o account for this, but he has since found evidence that it was due to someone leaving the two main doors wide open for a considerable length of time.

Rescue Apparatus.

The writer entirely endorses Mr. Hudson's note on page 154, which is in effect that the possibilities of this class of apparatus is entirely over-estimated and that the average man expects more from it than it was ever constructed to perform—it is an aid to a rescue party and not the rescuer.

One of the principle adjuncts to an oxygen-breathing apparatus is the Pulmotor, if properly used. This appartus is generally sent out in a box containing two means of applying oxygen, one of which can be applied in a a vitiated atmosphere, whereas other types can only be used in fairly pure air. The writer would, thesefore, suggest that these two should be so as to prevent confusion—one apparatus could then be taken in by a rescue party, and the other retained at the base of operations.

Mr. Hudson suggests that either the Dominion or Provincial Governments should see to the establishment of oxygen-breathing or rescue stations. He does not seem to be aware that these were already established in British Columbia, and are in course of establishment by the Albertan Government.

The writer would like to suggest as a proper subject for discussion the advisability of the Albertan and British Columbian Governments jointly providing a railway car fitted in a similarly efficient way as these in use in the United States, carrying a trained crew, who would move continually from place to place on the line of collieries extending from say Taber right through to Fernie or Morrissey. This crew might examine all apparatus at all collieries and see that they are kept in perfect order, and give demonstrations. The car might also be used as the means of transport of an official examinign doctor under the St. John's Ambulance Association. This would ensure a uniformity of comptency amongst the members of the different brigades, and might be carried one point further by training classes in nursing in the different colliery villages.

The writer is absolutely certain that there is not one man in charge of any colliery in Alberta or British Columbia who is in any sense, either so reckless, or so unmindful of the value of human life, as to risk either life or limb to the exigencies of output.

Yours, etc.,

JAMES ASHWORTH.

Exaggerated Statements from Nelson, B.C.

The Editor The Canadian Mining Journal:

Sir,—In The Canadian Mining Journal of March 1, there was printed a "Lettergram from the Nelson (B.C.) Board of Trade. This was signed "H. H. Currie, Secretary Nelson Publicity Bureau." May I be permitted to express the opinion that the publication of some of the statements—or, as I think, misstatements—in that lettergram may be expected to cause those who know the facts to regret that The Journal has unwittingly permitted itself to be used as tion—of a character that it were better to avoid giving space to in its columns.

It may suffice to show that my protest is well warranted if I take three of what I deem to be mis-statements and contrast them with what I believe to be the facts of the several cases I refer to; it does not appear to me necessary to go into further detail to make clear the generally inflated nature of the statements made as a whole.

1. "The Standard Silver & Lead mine at Silverton, last year opened a width of 83 feet of clear ore on the fifth level."

Assuming that "clear" ore means clean ore, my information, and belief after having visited the Standard mine several times during the last eighteen months, is that certainly not more than one-fifth of that width of clean ore has been opened on the fifth, or any other, level of the mine. Members of the Western Branch of the Canadian Mining Institute visited the mine and examined the fifth level last September, but, so far as I know, none would have the hardihood to make such a grossly exaggerated assertion a sthat there was seen a width of 83 feet of "clear" or any other commercial ore. Those who shall meet Mr. O. E. LeRoy, of the Geological Survey of Canada, may ascertain from him whether on the occasion of his last visit to the mine three months ago, or at any other time, he saw even 20 feet of clean ore, that is ore that could be shipped to the smeltery without previous concentration.

2. "Eighty-seven properties shipped ore last year, and the output was thirteen million dollars."

It is true that shipments of ore, from a single ton upwards, were made from numerous properties, but if it were desired to show the facts of the situation some discrimination would be made betwee nthose that made a quite unimportant output and those that made production of appreciably large value. As to value of output of ore—the "Preliminary Review and Estimate of Mineral Production for Year 1911," made by Mr. Wm. Fleet Robertson, and published by the Government of British Columbia, shows an estimated value of the

"total metalliferous" production of the whole Province, not of Kootenay district only, of but $12,224,316. This preliminary estimate was placed on the table in the Legislative Assembly of the Province on February 15, four days before the date of the Nelson "boost." It includes nearly all the placer gold of the Province; and all the lode production of the big mines in Boundary district; that of the Hedley Gold Mining Co., Similkameen, and that of the Coast district (Britannia, Marble Bay and other mines.)

3. "The iron and asbestos deposits are still virgin." It is true occurrences of iron ore are known, but, so far as I have been informed, no asbestos—that is, true asbestos, of commercial value—has yet been found in Kootenay district. Geological Survey officials inform me that hornblende has been mistaken in Kootenay for asbestos, but they have not yet found the latter mineral there.

The platinum resources of Kootenay are generally regarded, outside of a few men interested in local mineral claims, as existing largely in imagination.

Perhaps Nelson may yet realize the unwisdom of subsidizing uninformed assertion and insist that it receive for its money subscribed for publicity purposes the full value that may be obtained by telling facts only, which are quite good enough as regards the mineral resources of the Kootenay, without having to resort to fiction.

E. JACOBS.

Toronto, Ontario, March 9, 1912.

REPORT OF THE DEPARTMENT OF MINES OF NOVA SCOTIA FOR 1911

The report of the Department of Mines of Nova Scotia has been received, and the following table gives a summary of the mineral production for the year ending September, 1911. It also compares those figures with the output for the year 1910.

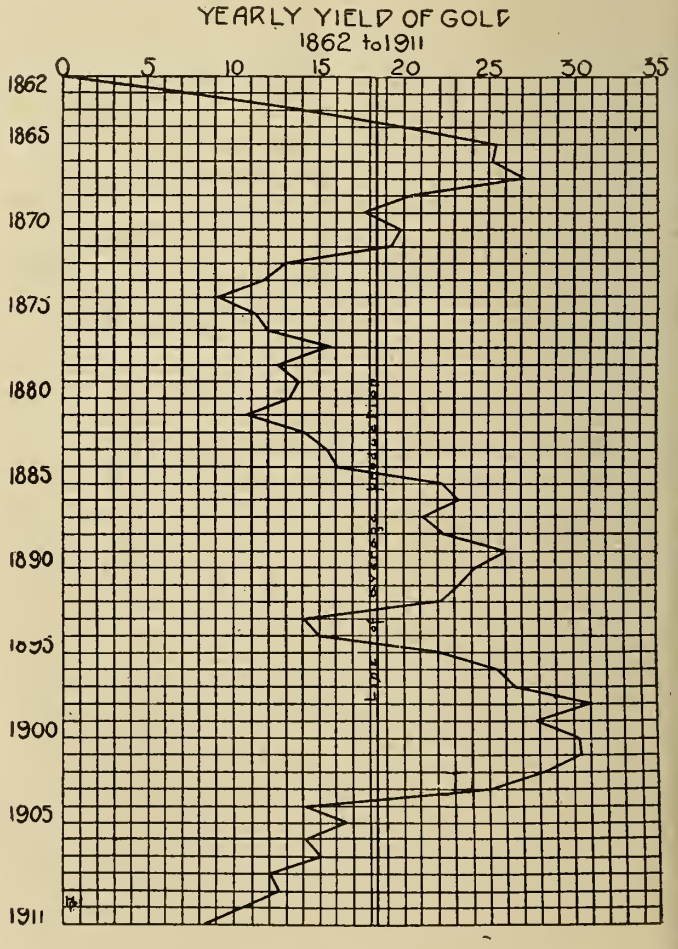
Mineral.	Quantity. 1910.	1911.
Coal raised (gross tons)	5,477,146	6,208,444
*Iron ore (net tons)	52.640	53,595
Pig iron made (net tons)	341,674	397.615
Steel ingots made (net tons) .	409,663	438,922
Limestone quarried (net tons)	483,100	525.286
Coke made (net tons)	493,167	545,619
Gypsum quarried (gross tons)	322,974	297,641
Building stone quarried (net tons)	8,503	11,226
Bricks made	21,305,500	23,273,700
Drain pipe and tile made (ft)	974.819	1,431.761
Grindstone, quarried (net tons)	325	380
Gold bearing ore mined (net tons)	49,557	18,320
Gold produced (ounces)	10,675	8,389
Manganese ore (net tons)	25	150
Antimony concentrate (net tons)	203	191
Moulding sand (net tons)	180	380
Tungsten ore (net tons).....	75	75
Sulphate of Ammonia	3,622	3,971

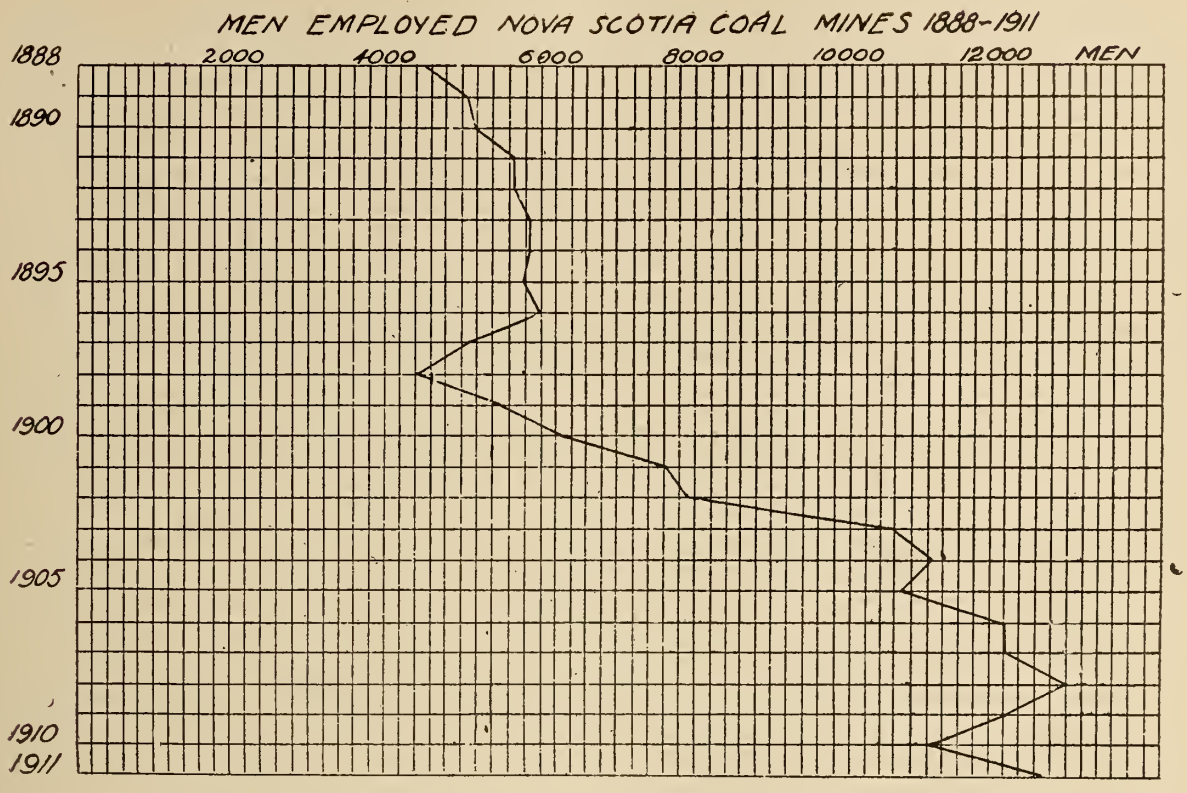
This report shows that, with the exception of gypsum, gold ,and antimony, there was a general increase in the mineral industry of the province. The production of gypsum decreased 25,333 tons, or a little less than 8 per cent. The tonnage of gold ore decreased by 31,237 tons, or 63 per cent.; but the gold produced decreased only 2,286 ounces, or a little over 21 per cent. The production of antimony concentrates decreased 14 tons, or 7 per cent.

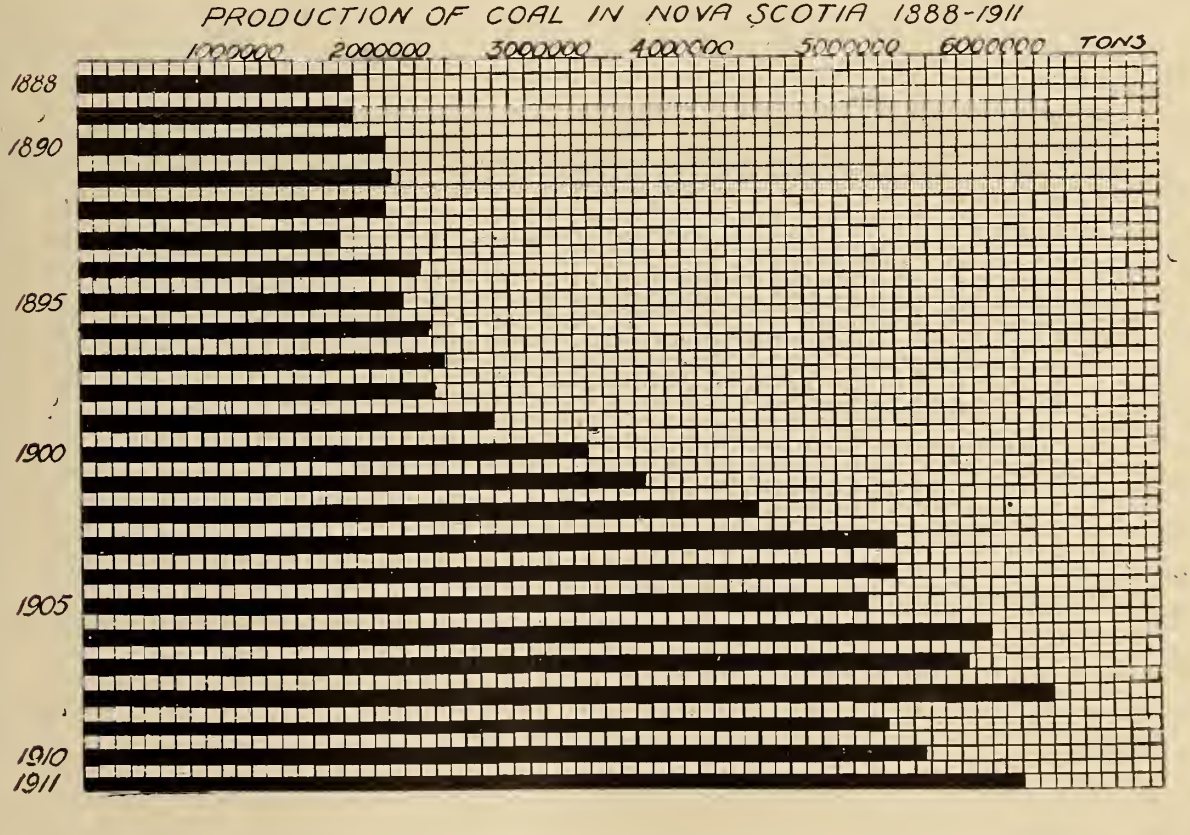
*Iron ore imported 1909-10, 705,351; 1910-11, 853,904 net tons.

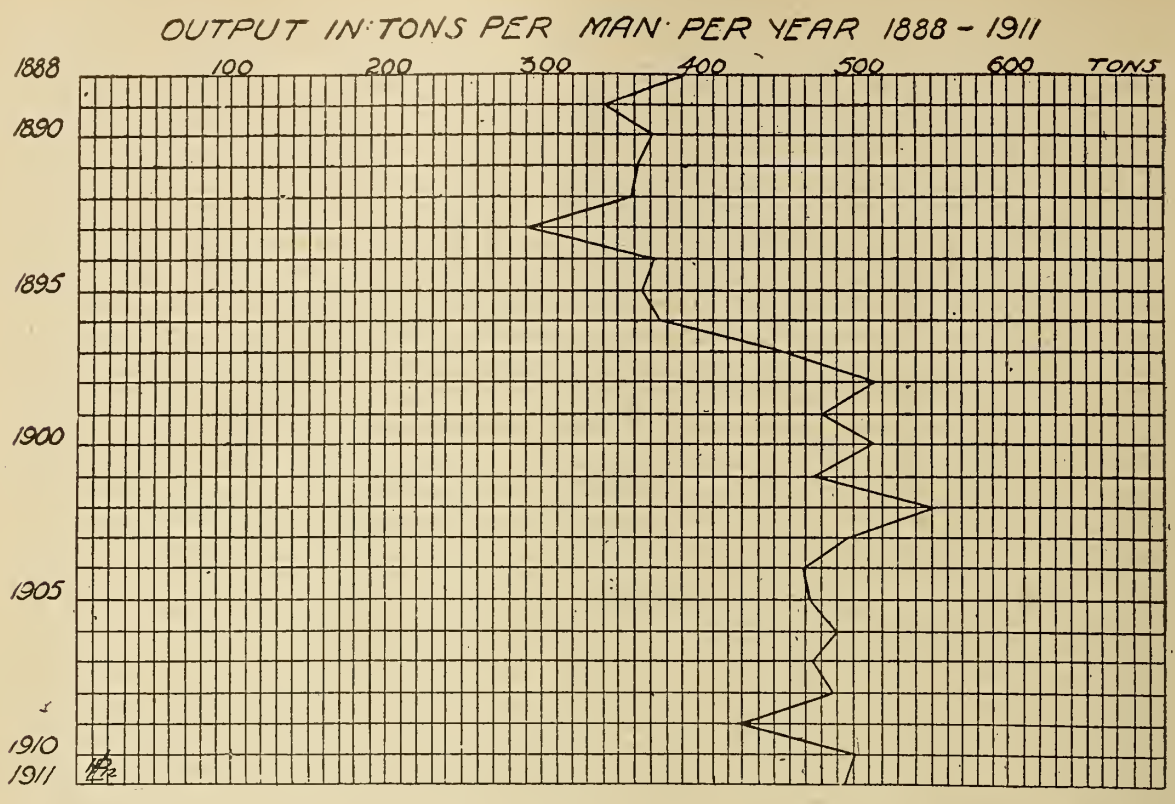
Coal Mining.

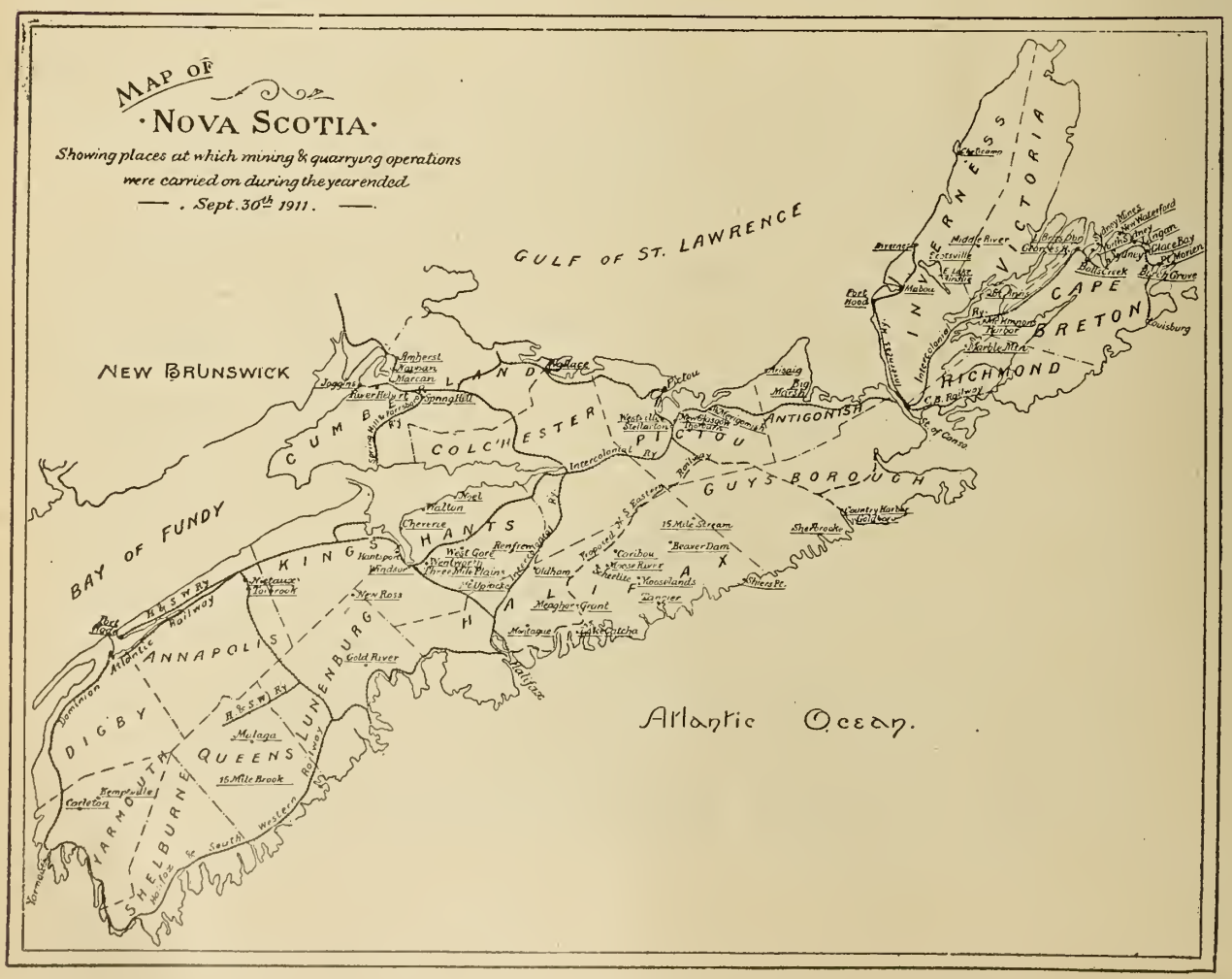
Coal mining, the most important mineral industry of the Province, shows an increased production of 731,298 tons, or a little over 13 per cent. over that of the previous year. The following table shows the distribution of coal sold during 1911, compared with the returns for 1910. This shows an increase in sales of 13.5 per cent.




MEN EMPLOYED NOVA SCOTIA COAL MINES 1888-1911
1888
2000
4000
6000
8000
10000
12000
MEN
1890
1895
1900
1905
1910
1911


PRODUCTION OF COAL IN NOVA SCOTIA 1888-1911
1000000
2000000
3000000
4000000
5000000
6000000
TONS
1888
1890
1895
1900
1905
1910
1911




MAP OF
NOVA SCOTIA
Showing places at which mining & quarrying operations were carried on during the year ended Sept. 30th 1911.
GULF OF ST. LAWRENCE
NEW BRUNSWICK
BAY OF FUNDY
Atlantic Ocean.
CUMBERLAND
COLCHESTER
PICTOU
ANTIGONISH
GUYS BOROUGH
INVERNESS
VICTORIA
CAPE BRETON
RICHMOND
HANTS
KINGS
ANNAPOLIS
DIGBY
QUEENS
LUNENBURG
YARMOUTH
SHELBURNE
HALIFAX
Amherst
Maccan
Joggins
River Hebert
Springhill
Pictou
Westville
Stellarton
Thorburn
Trenton
New Glasgow
Intercolonial Ry
Musquodoboit
Moser River
Tatamagouche
Malagash
Wallace
Parrsboro
Advocate
Noel
Walton
Cheverie
Windsor
Hantsport
Three Mile Plains
Kentville
Wolfville
Port Williams
New Ross
Gold River
Chester
Mahone Bay
Lunenburg
Bridgewater
Liverpool
Milton
Caledonia
Annapolis Royal
Digby
Weymouth
Yarmouth
Shelburne
Lockeport
Barrington
Clark's Harbour
Shag Harbour
Port Mouton
Liverpool
Milton
Caledonia
Brookfield
Truro
Tatamagouche
Wallace
Pugwash
Parrsboro
Advocate
Joggins
Amherst
Maccan
River Hebert
Springhill
Westville
Stellarton
Thorburn
Trenton
New Glasgow
Pictou
Musquodoboit
Moser River
Malagash
Wallace
Tatamagouche

	1910.	1911.
Nova Scotia	1,806,999	2,108,665
New Brunswick	530,614	541,591
Newfoundland	176,986	184,195
Prince Edward Island	79,492	80,637
Quebec	1,786,948	2,067,831
United States	290,668	332,301
St. Pierre	7,504	9,024
Bunker	217,685	204,681
Time Charter Boats	.....	25,545
Other Countries	.....	1,992
Tons	4,896,896	5,556,464

The production of coal by counties shows an increase in all except Inverness County. This is relatively small, being 31,325 tons, and is due largely to the flooding of the colliery of the Port Hood-Richmond Coal Company, on June 23, 1911, a feeder of salt-water suddenly making its appearance through a cover of 942 feet and flooding the mine.

Production by Counties.

	1910.	1911.
Cape Breton County	4,205,131	4,736,026
Pictou County	630,049	727,944
Cumberland County	277,862	411,695
Inverness County	364,104	322,779

The Dominion Coal Co., Ltd., is by far the largest producer, and its product is considerably augmented by its lease of the Cumberland Railway & Coal Co. The production of the various companies operating is shown by the following table:

Company.	Output.	Sales.
Dominion Coal Co., Ltd.	3,892,958	3,545,784
N. S. Steel & Coal Co., Ltd.	757,823	695,818
Cumberl'd Ry. & Coal Co., Ltd.	191,849	139,765
Acadia Coal Co.	466,337	372,900
Maritime Coal, Ry. & P. Co.	163,763	14,371
Inverness Ry. & Coal Co.	291,587	268,722
International Coal Co.	261,607	239,300
Sydney Coal Co.	3,687	3,363
MacKay Colliery	29,081	27,199
North Atlantic Collieries Co.	47,992	35,772
Port Hood Coal Co.	41,192	33,956
Minudie Coal Co.	54,481	46,134
Atlantic G'stone & Coal Co.	334	279
Colonial Mining Co.	4,485	3,140
Great Northern Coal Co.	1,267	618
	6fi,208,444	5,556,464

The importance of the coal industry can be judged by the number of persons employed in it. In the year ending September 30, 1911, the industry employed 12,522 me nand boys in skilled and unskilled labour, with a total of 3,527,149 days' work| The number employed underground were 5755 skilled workers, 3491 labourers and 739 boys, with a total of 2,802,534 days' work. On the surface were employed 1,064 skilled workers, 1,272 labourers, and 183 boys, at a total of 721,858 days' work. Construction work took 8 skilled labourers and 10 labourers, giving 2,757 days' work. There also were used 182 horses on the surface, and 810 horses underground.

During the year there were 185 accidents in the coal mines and of these 36 were fatal. Of the fatal accidents 8 were due to a gas explosion on January 3rd, 1911, in the Sydney No. 3 mine.

The volume contains a special report by the Deputy Inspector of Mines on this explosion, and also one by a commission appointed to investigate it.

There is also a special report on the flooding of the Port Hood mine.

The reports of the Deputy Inspector contain much detailed information as to surface and underground equipment and timber used during the year in the different collieries operating.

(To be continued.)

ANNUAL REPORT OF THE TRETHEWEY SILVER-COBALT MINE, LIMITED

Directors' Report Submitted at the Annual Meeting of Shareholders Held on Wednesday the 28th Day of February, 1912.

The directors have pleasure in submitting herewith statement of revenue and expenditure, balance sheet and report for the year ended December 31st, 1911.

The gross revenue from the sale of ore and other sources during the past year amounted to	$372,622 45
While the total expenditure for the year was	212,316.04
Showing a surplus of	$160,306.41

The following figures show the production, gross revenue and expenditure since the inception of the company until 31st December, 1911:

	Gross Ounces	Gross Revenue	Expenditure	Net Profit	Dividends Paid
1906-7	467,992	$249,262.61	$124,739.82	$124,522.79	$ 75,636.00
1908	767,002	357,970.78	147,446.47	210,524.31	141,817.50
1909	710,092	350,257.39	150,449.75	199,807.64	144,545.00
1910	865,777	437,552.25	199,751.83	237,800.42	100,000.00
1911	770,838	372,622.45	212,316.04	160,306.41	200,000.00
Total	3,581,701	$1,767,665.48	$834,703.91	$932,961.57	$761,998.50

The decrease in production in 1911 as compared with 1910 is accounted for by the fact that a large proportion of the milling ore dealt with during the year was taken from old workings from which the original high-grade veins had been removed, thus reducing the average value of the mill heads with a consequent reduction in the value of the jig and table concentrates produced.

The increased expenditure has been largely incurred in extensive underground exploration and development work, all of which has been charged to operating account.

The shipments during 1911 were as follows:—

	Tons.	Ounces.
5 cars high grade ore and jig concentrates to Carnegie	125	272,309
4 cars high grade ore and jig concentrates to Deloro	92	141,172
4 cars concentrates and low grade ore to Carnegie	97	66,746
2 cars concentrates to Deloro	63	62,647
4 cars concentrates to Thorold	109	104,579
2 cars concentrates to Orillia	53	54,935
1 car slimes to Denver	32	7,300
Bullion to London	..	6,836
		716,464

Mining Operations.

A report and map prepared by the manager covering the development work and physical condition of the mine up to the present date accompanies this report, from which it will be seen that the east central portion of the property is still practically unexplored, and the possibilities of meeting with important ore bodies through the workings which have been opened up by the past year's development work are excellent.

Operations at the north end of the property have been temporarily suspended pending the continuation of the north cross-cut, which, when completed, will connect the north and south workings, enabling the northerly portion of the property to be operated more advantageously through No. 6 shaft, which is located close to the mill and near the centre of the property.

Milling operations have proceeded without interruption during the year, 33,339 tons having been treated, with a recovery of 486,431 ounces, added to which 284.407 ounces were recovered from high-grade shipping ore, making the total production 770,838 ounces for the year. Certain alterations are contemplated to be made in the near future which will enable a larger tonnage of ore to be dealt with so that the returns from this source should be augmented during 1912.

Water Supply.—During the past year water in Sasaginaga Lake, which is the source of supply for milling purposes, became dangerously low, and as the Town of Cobalt has the first right to this body of water for municipal purposes, it was necessary for the mining companies using it as a source of supply to take steps to protect themselves. By co-operation of the Coniagas, Buffalo, Hudson Bay and Trethewey Mining Companies, the Mines Water Supply Company was formed, and at an expenditure of about $20,000, borne by these companies, a pumping station has been installed at Mud Lake, from which the supply of water in Sasaginaga Lake will be maintained to meet all requirements of the town and mining companies.

Power.—The service of compressed air for mining purposes, obtained from the Northern Ontario Light & Power Company has been improved, and while no further interruption is likely to occur, the company's compressor plant is available at an hour's notice to meet such a contingency. The electric power for milling operations, obtained from the same company, has been entirely satisfactory during the year.

Numerous properties have been submitted for sale to the company during the year, but nothing satisfactory to the directors has yet been found, so that the one million shares in the company's treasury are still intact, and no departure will be made by the directors from the policy already laid down of consulting with the shareholders before any purchase is made.

The average price received for silver during 1911 was 52.87 cents per ounce. The price of silver has recently advanced to about 60 cents per ounce, which, if sustained, will favourably affect revenue for the coming year.

ALEX. M. HAY,
President.

Toronto, February 17th, 1912.

* * * * *

Trethewey Silver-Cobalt Mine, Limited.

Mine Office,
Cobalt, Ont., February 12th, 1912.

To the President and Directors,
The Trethewey Silver-Cobalt Mine, Limited,
1428 Traders Bank Building,
Toronto, Ont.

Gentlemen:—

I beg to submit the following report covering past development, and the physical condition of the mine as at the present date.

Geology.—The geological conditions show that the Huronian conglomerate occupies about 29.30 acres covering the entire east portion of the claim, and extending from the north to the south boundary. The remainder, about 10.65 acres on the west side, consists entirely of the Keewatin rocks.

Veins.—There are two definite vein systems developed on the property to date. The vein system on the south part of the claim consists of a series of veins with a general east and west strike, covering an area of approximately eight acres. In this group or system there are 22 veins, although some of the smaller ones are branches of the larger and stronger veins.

For the purpose of this report I have divided the property arbitrarily into nine blocks, as follows.—

Block No. 1, being the southeast portion of the property, is bounded on the east by the "Fourth of July" and "Meyer" veins section of the Nipissing, on the south by the Coniagas mine, and contains about 3.02 acres. This block has been very thoroughly developed, and a large tonnage of high grade and milling ores have been extracted therefrom. Notwithstanding the large amount of work which has been done here, however, there are a number of small undeveloped areas within this block which are extremely promising, and I am of the opinion that there are excellent chances of encountering other bodies and lenses of ore in this section.

Block No. 2, lies west of Block No. 1, adjoining the Coniagas mine to the south, and containing about 1.44 acres. The westerly portion of this block is now being developed, and it is within this area that the "A" and "H" vein systems are at present being stoped. On "H" vein, which has been a steady and consistent producer for the past six months, a stope 255 feet long has been opened. As at this date the major portion of the available ore in the west end has been broken, but there remains the whole of the centre and east section still to be stoped.

Block No. 3, lies directly north of No. 2 Block, and embraces 1.74 acres. The only ore body thus far opened within the boundaries of this block is that contained in "D" vein. This vein produced some very rich ore during the time that Mr. Trethewey operated the property. During the past year some fair grade ore was stoped here, and some very fair grade ore still remains in the back of this stope, which will be extracted later. From the east face of "D" vein drift a short crosscut has been run to the south, where the vein seems to have faulted. Further exploration on this portion of Block No. 3 will be undertaken at an early date.

Block No. 4, lies directly west of Blocks Nos. 2 and 3, and contains 1.74 acres. In the west portion of this block the overlying Huronian formation is shallow, and little or no work has been done in this part of the mine for a number of years. Before the mill was erected, and at a time when only a shipping grade of ore could be profitably dealt with, work was confined to No. 1 vein in this area, and very little crosscutting was done. Profiting by recent experience, however, it is probable that additional ore bodies will be found, when development work is resumed in this section.

Block No. 5, occupies the east central portion of the property, and contains 2.52 acres. There has been no work done within its boundaries, other than surface trenching, which uncovered a number of fissures, but none of them showed any ore at their outcrops. This condition, however, does not mean that ore will not be found at depth, as many of the best producing veins on the property have been barren at, or near, the surface. The Huronian formation being deeper here than in any other portion of the property, it is reasonable to expect that further development work in this block

will result satisfactorily, and the same will be undertaken during the present year.

Block No. 6, lies almost in the centre of the location and has an area of 2.66 acres. The only work done in this area is the "North Crosscut" which was run on the first level through the block, from the southeast corner, in a northwesterly direction into Block No. 7. No ore body has yet been found, but further aggressive development will be undertaken in this section at an early date.

Block No. 7, lies to the north of No. 6, and contains 2.72 acres. In this block a wide vein known as the "Mill Fissure" was encountered in November, 1911, in the "North crosscut" above mentioned. At the point of intersection the fissure contained only patches of calcite, with occasional small silver values, the balance of the vein filling being mostly clay gouge. So far as development work has proceeded, no rich ore has been encountered at this horizon, but I am of the opinion that such will be found by further drifting and sinking. Owing to the long distance which the North Crosscut has been run from the working shafts, it became necessary to make a raise to the surface on this block in order to dispose of waste rock extracted during the process of development and to obtain ventilation. This raise was holed through last week, and will be designated No. 6 shaft. This will enable development work to be carried on advantageously from this point. The plan for further development on the mill fissure contemplates drifting east where the vein in the face looks very promising, and is heading towards several fissures in Block 5, which will be developed through these workings.

Block No. 8. This block is situated on the northeast corner of the property, and contains 4.18 acres. It has within its boundaries all of the work done from No. 4 shaft. In this vein system considerable high grade ore has been encountered, but it is a peculiar fact that the veins here do not produce any large quantity of milling ore. Further development of this block is contemplated by the continuation of the North Crosscut from the mill fissure, connecting up the second level of the No. 4 shaft by a raise, which will give a complete underground connection from the south end of the property to the north boundary.

Block No. 9. This block, consisting of 19.46 acres, contains practically all of the Keewatin area. So far as exploration has gone, no ore bodies of any importance have been found in this area, but further exploration is contemplated during 1912.

The development work during the past year and to date is as follows.—

Drifts and crosscuts	2,801	12,369
Shafts.	102	740
Raises and winzes	168	1,239
	3,071 feet	14,348 feet

A large proportion of the work done during 1911 was unprofitable. but necessary crosscutting, which will enable future development work to be conducted more advantageously.

Owing to the irregular occurrence of veins and values, it is impossible to estimate with any reasonable degree of accuracy, the tonnage and value of ore rendered available by development work, but judging from the operations conducted during 1911, the amount of ore placed technically "in sight" is about equal to the amount of ore mined during the period.

The total production from the areas already developed and worked to January 1st, 1912, has been slightly over four million ounces, including the ore mined by Mr. W. G. Trethewey before the property was taken over by the company. It is not unreasonable to expect that a large production will be obtained from the ground still to be explored and developed within the confines of the property.

The physical condition of the company's plant is in excellent shape, and I look forward to the year 1912 with every hope and expectation of an increased production and profitable operation.

Yours very truly,

CHAS. A. O'CONNELL,
Manager.

CANADIAN MINING INSTITUTE—*WESTERN BRANCH*

The twelfth general meeting of the members of the Western Branch of the Canadian Mining Institute was held in Vancouver, British Columbia, on Thursday and Friday, February 15th and 16th. Mr. Robert R. Hedley, of Vancouver, chairman of the branch, presided, and the arrangements for the meeting, in connection with which four sessions were held, were made by the branch secretary, Mr. E. Jacobs, of Victoria, B.C.

Other members present beside the chairman and secretary, were: Messrs. W. H. Armstrong, W. M. Brewer, B. Browitt, S. J. Castleman, Neil McL. Curran, James Findlay, C. F. J. Galloway, Chas. Graham, Thos. Graham (chief inspector of mines for British Columbia), E. A. Haggen, A. E. Hepburn, A. G. Larson, Alex. McKillop, P. J. Moran, E. Priest, W. F. Robertson (provincial mineralogist), Alex. Sharp, W. J. Sutton, T. J. Smith, Bruce R. Warden, and others. Among the non-members present were: Mr. E. W. Parker, of Washington, D.C., statistician of the Division of Mineral Resources, United States Geological Survey; Mr. H. M. Wolflin, engineer in charge of Mine-Rescue Training Stations and associated work of the United States Bureau of Mines; Prof. Milnor Roberts, dean of the College of Mining, University of Washington, Seattle, Washington, and Prof. J. Daniels, also of the faculty of that university; Mr. W. T. Perkins, of Seattle, vice-president for the State of Washington of the American Mining Congress; Mr. H. E. Metcalf, of Pittsburg, Pennsylvania, first vice-president of the Draeger Oxygen Apparatus Company; Mr. F. Napier Denison, of the Dominion Meteoroligical Office, Victoria, B.C.; W. J. Mazay, Crow's Nest Pass, B.C., and the following among many more, residents of Vancouver. Messrs. James Ashworth, Philip Billinghurst, R. J. Drinnan, D. Morkill, — Shannon, and Dr. McTavish.

Thursday Morning Session.

The meeting was opened at 11 o'clock in the hall of the Vancouver Board of Trade. The secretary read expressions of regret at inability to send official repre-

sentatives from Mr. R. W. Brock, director of the Geological Survey Branch, and Dr. Eugene Haanel, director of the Mines Branch, of the Canada Department of Mines; also regrets at inability to be present, by reason of pressure of official duties, from Mr. D. C. Botting, of Seattle, Washington, State inspector of coal mines, and Mr. John T. Stirling, provincial inspector of mines, Edmonton, Alberta.

Welcome Address by the Mayor.—A welcome was extended to the members of the Western Branch and the visiting non-members, on behalf of the City of Vancouver by Mayor Findlay, who delivered a brief address. He paid a particular compliment to the United States mining men present, it being, he said, to the men and capital from the other side of the International Boundary Line that the province is indebted for a large measure of activity in the mines of British Columbia. He referred to a recent visit to Porcupine camp in Ontario and expressed the opinion that there are as many promising mining propositions offering for investment in this province as in that Eastern mining camp.

The chairman suitably acknowledged the mayor's courtesy, and then expressed the hearty appreciation of the presence at the meeting of official representatives of the United States Geological Survey and Bureau of Mines, respectively, and of the visiting professors from the University of Washington College of Mining. These several gentlemen, having stated the pleasure they felt in attending the meeting and voiced their good wishes for its success, were followed by Mr. Perkins, who brought greetings from the Seattle section of the American Mining Congress, and by Messrs. Robertson and Sutton.

Chairman's Address.—After a few introductory words, Mr. Hedley said: "It is understood the chief subject of papers and discussion at this meeting shall be coal and associated matters, so I shall refer to new coal fields in the northern interior of British Columbia.

"One of these northern fields has been little spoken of, and its importance has been overshadowed by recent developments in the anthracite field at the headwaters of Skeena River. I refer to the Copper River coal field, also in Skeena district, in which latter field much progress in development has been quietly made under the direction of competent men in the employ of a leading financial company of the City of Vancouver, which company holds seventy-five sections at Copper River. This field may be connected with the Grand Trunk Pacific by a railway 32 miles long to Hazelton, which is said to offer no serious difficulties to construction. It has been reported on by Mr. Edward Dinan, of Seattle, who pays high tribute to the character and occurrence of the coal, and calling attention to the large area of undisturbed coal-bearing formation, argues a vast tonnage. Mr. Rees Treharne, of Cardiff, who reported for an English company, to which the property has been under option for the past 15 months, stated that 12,000,000 tons are available from openings on Coal Creek, of seams already proven. Seven commercial seams have been proven on the property, if one may include as commercial three seams 28 to 30 inches in thickness, having a favourable mining gouge. Six of those are contained within approximately 300 feet of measures.

"The lowest seam is shown by open-cut only; it is 10 feet wide, but rather mixed as to quality. The next, known as the main seam, though but little developed, shows 5 feet 6 inches of excellent clean coal. The next higher is developed by a drift, probably now more than 200 feet in length. This seam is 6 feet thick, with 5 feet 9 inches of clean coal and three inches of good mining dirt. Again, higher up, there is a 30-inch seam, having 28 inches of clean good coal, and this has been driven on for 103 feet. Above these seams, possibly a mile and a half to two miles up Coal Creek, a fine coal seam outcrops; this has six inches of mining dirt on the floor, and 30 inches of excellent coal.

"The coals vary in ash up to 10 per cent., and give an expanded analysis of lowest and highest determined:—

Fixed carbon	54 to 64 per cent.
Volatile combustible matter	41 to 30 per cent.
Water	3 to 5 per cent.

This gives the coal from the main seam a good standing among the bituminous coals, but relegates the other to the low-carbon bituminous class according to Dowling's split volatile ratio. While no conclusive tests for coking quality have been made with Copper River coals, Mr. J. O'Sullivan, of Vancouver, classifies them generally as coking coals, and Mr. Godfrey, under whose direction the development work has been carried out, conducted a rather severe test by coking in a pit, obtaining as a result a brilliant, firm coke, of long texture, that promised excellent commercial results. So far as has been observed, the measures have a dip of 28 to 30 degrees and generally afford favourable roof and floor.

"I should like to talk about the coal areas of Groundhog Basin, but the only authentic information I could give you would be by quoting Mr. G. S. Malloch, of the Geological Survey, who states that the measures have a thickness of 3,000 feet and contain coal in commercial seams only near the top and bottom, and that the coal is anthracitic in character. An average of analyses obtained by the British Columbia Anthracite Company expands to

Fixed carbon	91 per cent.
Volatile combustible matter	5 per cent.
Water	4 per cent.

Applying Dowling's split volatile ratio, this coal is placed by its high water in the semi-anthracite class. This coal is from seams of the upper measures, and is purely superficial. It is reasonable to expect an improvement in the water content. Indeed, Mr. James McEvoy, who has done some development work on the upper seams, obtained better results, averaging: Fixed carbon, 83.95 per cent.; volatile combustible matter, 6.75 per cent.; water, 1.90 per cent., and ash 7.40 per cent., expanding to: Fixed carbon, 90.7 per cent.; volatile combustible matter, 7.3 per cent., and water, 2 per cent., therefore classing as anthracite.

"Mr. R. C. Campbell-Johnston, who is developing the seams of the lower measures, quotes an analysis which expands to:

Fixed carbon	92. per cent.
Volatile combustible matter	6.5 per cent.
Water	1.5 per cent.

gaining it a place among the anthracites.

"Some interesting samples, said to have come from the back of the Babine country—a wide field—were brought to me recently; these gave an expanded analysis of:

Fixed carbon ..... 54 to 65 per cent.
Volatile combustible matter....24.5 per cent.
Water. . . . . 1.5 per cent.

"Turning to metalliferous mining—while I do not wish to be unduly optimistic, I must be permitted to say that I feel a measure of optimism as to the future, especially the immediate future, of metal mining in British Columbia. There is in all parts of the Province mineral wealth awaiting development. That it still waits is our own fault—we have not tackled it in the right way.

"Given favourable opportunities, there is capital from Eastern Canada, Great Britain, France, Germany and the United States available, on suitable terms, for exploiting our mineral resources, but their value must be properly brought to the notice of capitalists in those countries. Prospects must be opened, and partially-developed mines got in order so that visiting mining engineers, after making their examinations, may be so well informed as to be in a position to do justice to the properties. In this direction lies the opportunity for the smaller capitalist of this Province, whether by syndicates or development companies. The owners of mining properties must learn to realize the requirements of the situation and assist by asking only suitable terms.

"Last year we had visits from mining engineers of high reputation, who either made flying visits of observation or spent much time in the Province. Capital, the greater part of which comes from the United States, is being invested liberally in Slocan district, and mines that, for one reason or another, have for years lain dormant or nearly so, are now being developed with most promising results. In other districts, too, the position shows marked improvement. The Britannia, within 40 miles of Vancouver, is to-day a profitable producer, due entirely to the faith of New York capitalists in its great mineral resources, backing with ample money the competent engineering talent employed in their development. By United States capital, represented by Mr. M. K. Rodgers—whom we have every reason to admire and emulate, and to whom must be credited the successful development of the Nickel Plate group of the Hedley Gold Mines, Limited, both in its initial and re-organized and splendid condition as a dividend-payer to-day—the Hidden Creek copper mine was sufficiently developed to attract the attention of the Granby Company, its present owner. I could easily multiply instances where capital from our neighbour to the south is doing pioneer work in the Province as well as others where it is providing for the extensive development of British Columbia mines.

"At home, the Consolidated Mining and Smelting Company of Canada, Limited, is similarly doing important work in Kootenay and Boundary districts, as witness the St. Eugene mine, East Kootenay (the known ore bodies of which, however, have been nearly exhausted); the Sullivan, also in East Kootenay; the Richmond-Eureka, in the Slocan; the No. 1 and the Tiger, in Ainsworth camp; the Molly Gibson, near Nelson; the H. B. group and the Silver Dollar, near Salmo; the Snowshoe, Phoenix Amalgamated, and No. 7 in the Boundary district; as well as the important Centre Star group (to which has lately been added the once famous Le Roi), in Rossland camp. It is noteworthy, too, that the Consolidated Company is doing effective metallurgical work, as well in research as in practice.

"Then, Vancouver capital is courageously developing gold-copper claims on Khutze Inlet, and gold claims at Surf Inlet, Princess Royal Island. Also, there are several purely provincial companies engaged in exploiting silver and silver-lead properties in Hazelton district, Skeena, while others are giving attention to mines in Sheep Creek camp, and to some in Lillooet district. Should the development of any of these properties prove too big an undertaking for local companies, there will not be any difficulty in obtaining outside capital for them, if it first be demonstrated they have sufficient reserves of profitable ore, and suitable terms be offered. Beside the above-mentioned Vancouver exploitations, there is the development and equipment as a producer of the old Monarch mine, near Field, and there are numerous coal enterprises—notably in Nicola Valley, on Vancouver Island, on Graham Island, and in fields in Skeena River country.

"Opportunities are numerous, there is no doubt of it—in our Coast district, in Lillooet and Northern Yale, in the Similkameen-Tulameen district, and in many parts of East and West Kootenay. And in this connection it should be observed that mining is a legitimate business if properly conducted as an industry and not, thereby, as a speculation or a gamble.

"One factor that will aid the seeker after opportunities for investment in the mining field is the marvellously great railway extension in progress throughout the Province—the Grand Trunk Pacific passing through all that great field in the Skeena, generally referred to as the Hazelton district, and rendering accessible the northern coal fields; the Canadian Northern Pacific from Yellowhead pass down the valley of the North Thompson, that will bring the old Cariboo and the Clearwater districts more within reach; the Canadian Pacific, from Golden along the valleys of the Columbia and Kootenay Rivers, down to the Crow's Nest Railway below Fort Steele; and the Kettle Valley line from Nicola to Midway—these railways will bring us into touch with most promising mining fields. Last, but not least, to-day's newspaper informs us that "the British Columbia Government proposes to send engineers to the country between Stewart, at the head of Portland Canal, and Groundhog Mountain, to secure data for the proposed construction of a railway from the present inland terminus of the 12-mile line from Stewart to the Groundhog Mountain coal fields, this line to eventually form a link in another transcontinental railway system.

"Finally, I shall quote some figures that strikingly illustrate the progress of mineral production. Since 1852, or in 60 years, the value of the mineral production of British Columbia, has aggregated $397,000,000, of which comparatively large value, $123,000,000, or 31 per cent., is the production of the last five years. 1907-11."

Mineral Production in 1911.—The Provincial Mineralogist, Mr. Wm. Fleet Robertson, presented to the meeting a "Preliminary Review and Approximate Estimate of Mineral Production for the Year 1911." He directed attention to the leading features of progress in the year and explained that the net decrease of $3,165,250, as compared with 1910, was almost wholly accounted for by the strike of employees at the Crow's Nest Pass coal mines, which extended over nearly two-thirds of the year, and not only affected the production of coal and coke, but, through the consequent cutting off of the coke supply for the blast furnaces of the

smelteries, materially reduced the production of gold, silver, and copper as well. Further, the destruction by fire in the summer of 1910 of railway trestles and bridges, and of mine and concentrating mill plants in Slocan districts, which essentials for production had as yet been only in part replaced, had detrimentally affected the output of silver, lead, and zinc. The total value of the mineral production was estimated at $23,211,816, as against $26,377,066 in 1910.

Incidentally, British Columbia's proportion of the mineral production of the whole of Canada for the period of 26 years—1886-1911—covered by the published official records, was shown, as follows: "Placing the aggregate value of the production of Canada at $1,245,000,000 (which allows for 1911 a Dominion total of $115,000,000, an amount $10,000,000 greater than that of 1910), and British Columbia's proportion for the same period at $333,000,000, it follows that this Province has to be credited with nearly 27 per cent. of the value of the mineral production of the whole of Canada in the 26-year period under notice."

Death of Mr. John B. Hobson.—The secretary reported the death, on January 7th, ultimo, of Mr. John B. Hobson, who was one of the first members of the Canadian Mining Institute and one of its applicants for incorporation by the Dominion Parliament in 1898. He was a member of the Council of the Institute in the years 1898-99 and 1901-02, and a vice-president in 1903-04. The nature of the work he did in inaugurating on a large scale hydraulic placer mining for gold in Quesnel mining division of Cariboo district, and the prospective great value of his having demonstrated that much gold is contained in the enormous gravel deposits of that part of the Province—officially estimated at approximately $300,000,000—were briefly pointed out, and the loss to the placer gold mining industry of British Columbia in Mr. Hobson's death was deplored.

(To be continued.)

SPECIAL CORRESPONDENCE

ONTARIO.

Porcupine, Swastika and Larder Lake.

Three stamp mills will be running in Porcupine before the end of March, marking the opening of the productive history of the camp. The McIntyre mill dropped stamps for the first time on March 1, although the excavations were not commenced till the middle of December. It should be running at its full capacity of 50 tons by the end of the month. This is actually the first stamp mill to produce in the northern gold area. A small test plant at the little Pet mine will also be in operation before the end of the month. Although the official opening of the Dome mill is not until March 30 there is so little now to finish that the first trial runs will be made on or before March 20, and adjustments should have been made and the stamps dropping in tune by Dome Day. The South Porcupine Board of Trade and the Dome directorate are combining to make the occasion memorable. Already there have promised to come the Hon. Frank Cochrane, best known in the North as late Minister of Lands, Forests and Mines for Ontario, and with him in a private car he will have a number of Ottawa notables, interested in the North country. From Toronto the Hon. W. H. Hearst, Minister of Lands, Forests and Mines, has promised to attend, and with him will undoubtedly appear a large number of members of the Legislature; the T. & N. O. Commission will charter two private cars for the trip, and the Dome directorate will patronize the gathering en bloc. There will be a ceremony of dedication at the mill, and afterwards a banquet at the King George Hotel.

The work at the Dome has made very rapid headway in the last six weeks both on the mill and under ground. Before the stamps drop there will be blocked out above the 50-foot level two years ore reserves if the mill were allowed to remain at its present capacity of 400 tons per day. Ore has been blocked out for over a length of 300 feet by 200 feet in 100-foot sections, and a raise has been broken through to the surface to connect with the tramway to the head of the mill so that this ore is now immediately available. The company is so confident that underground development will more than justify diamond drilling results that there will be no immediate attempt to rush the shafts down to any depth but level after level will be opened up and developed systematically. There is sufficient ore on the 50-foot level in sight for all present needs. At a depth of 200 feet in No. 7 shaft some of the best ore in the mine has been found.

For the present the company will generate its own power. The deal to take power from the Porcupine Power Co. fell through, and it is likely that the auxiliary plant at present on the property will be used until other arrangements can be made, possibly with the Waiwaiten Power Company. There are at the present time nearly 500 men employed at the Dome altogether.

Since Mr. P. A. Robbins issued his first annual report developments underground have been, without exception, most satisfactory.

On the No. 4 vein there has been great improvement. In the annual report it was stated that values in the northeast drift at the 100-foot level had fallen off. Since its issuance it has been found that the wrong vein was being followed and to-day the vein in this drift runs $22.50 to the ton. No. 2 vein has also shown improvements. On the 100-foot level it now varies from five to fifteen feet, and there are five faces of ore. On the 200-foot level there are two faces in ore. There are nine drills running on the Hollinger alone, making about 700 feet a month. Two shafts are to be sunk as connecting links between the 200-foot level of the Hollinger and the Dixon and Miller Middleton, making it quite plain that shortly all three properties will be merged and worked from one central shaft. The mill building is now completed, but delivery of machinery is slow and stamps are not likely to drop before June.

Development on the No. 2 vein of the Vipond at both levels is proving up good ore bodies. At the 200-foot level at the beginning of the month the vein showed five feet wide of ore which on the surface ran about $50. Altogether sixty feet have been opened up in two sections of thirty feet. A raise is now being put through to the surface from the 100-foot level of No. 1 vein, and the ore in it is six feet wide.

On the Altogether on the 100-foot level about 600 feet of drifting has been done, of which about 530 feet is in ore. Later exploration on the 200-foot level has shown that what was at first believed to be No. 3 vein is probably a stringer, and the vein is now being sought by a cross-cut.

At a meeting of the Porcupine branch of the C. M. I. at the Hollinger mine a very interesting paper given by G. W. Thomson, of the Pearl Lake mine evoked a spirited debate on the value of

diamond drilling in the Porcupine camp. Mr. Thomson exhibited some carefully compiled charts on the work at the Pearl Lake mines, prefacing his remarks with the statement that he did not regard any conclusions arrived at as accurate but only approximate. Messrs. Stewart Thorne and H. Y. Russell, took a strong position against diamond drilling. In a paper read by Mr. Thorne, Porcupine, was placed last on the list as an area where the results of diamond drilling was of value. Results obtained in the Porcupine section as a whole did not justify the expense involved. In the course of discussion Mr. Globe, of the Hollinger, stated that in relocating a vein that had been lost the diamond drill had been quite successful with them. While not combating in its entirety the contention of the critics, Capt. Anchor, of the Dome Extension, stated that he believed the diamond drill was economical in low ground covered with heavy overburden and adjacent to a known ore body.

It has been announced that on March 11 the T. & N. O. service will be continued to Timmins Townsite, a local meeting the afternoon train and taking out passengers to their destination. An agent has already been appointed for the Schumacher station. Until further ballasting can be done in the spring it will be impossible to give a Pullman service farther than South Porcupine.

A shot drill is now at work on the Wright Hargreaves claims at Swastika, which have been optioned to Weldy Young, of Haileybury.

At the McEnaney property of the Crown Reserve the ore body first struck in the shaft is now being drifted upon at both the hundred and the 200-foot levels. It shows a considerable amount of gold, but its values are mainly in fine grained sulphides. The ore runs between $20 and $30 to the ton.

The shaft at the Rea mine has now reached the 400-foot level and crosscutting for the vein will commence at once. The result will be looked for with a great deal of interest. At the 200-foot level, and at the 100-foot there was a good body of $20 ore, but at the 300-foot level while the vein was much wider it was so lean as to offer little promise of mining at a profit. The results obtained at the 400-foot level will decide to a very considerable extent the future of the mine.

Results at the lower levels of the Swastika have been reassuring enough lately to permit of the erection of a small mill. Plans and specifications are now being obtained for a ten-stamp plant. The old five stamp plant previously used was so ancient that it had to be altogether discarded.

Cobalt, Gowganda and South Lorrain. — After a sharp assault the opponents of the Cartwright regime in the Temiskaming Mining Company had to acknowledge defeat at the annual meeting. The great stumbling block to agreement was the option on the North Dome property in Porcupine, but the majority interests were stubborn on this point and successfully held to their new acquisition.

What appears now to be the most important event in the history of the West Ridge properties for years has been the discovery that the Coniagas is getting silver in considerable quantities out of the Keewatin rock in a vein followed beyond the contact with the conglomerate. So well established has it been that values would cease in the underlying Keewatin that exploration has ceased altogether or has been of a very half-hearted nature when the contact was reached so that the new find opens up important possibilities. The discovery was the result of an accident to the drill-runner following the vein into the Keewatin for some distance after the contact had been reached and without the mine captain's knowledge. The shots revealed such good ore that the vein has been followed and for a hundred feet has held strong, a carload of high-grade ore being taken out of it. That other companies in a similar position will now be induced to further explore their Keewatin is certain, and it will be very interesting to learn what the results of their efforts are.

Another Cobalt company has sought alien ore reserves. The Right of Way has purchased an option to the Bishop claims in the Silver Mountain district of the Port Arthur. A considerable gang of men will be at once put on the propetry and systematic prospecting started.

In the South Lorrain field there are spring stirrings. The Wettlaufer, which has just declared its fifth dividend of 5 per cent., has taken an option on the Keeley and bought all the adjoining properties that could be economically acquired. Development will be confined to the diabase at the Keeley. The Bellellen mine, the only other producing property last year, has shut down owing to a split on the directorate of the company. The Alice Lorrain is to instal a six-drill plant and the Gailey property is opening up again.

The Dr. Reddick Larder Lake Mining Company has made an assignment, the assignee being D. Smiley Sawyer, a brother of the president of the company, Bannell Sawyer. During the past six months an honest attempt was made to work the mine at a profit and it was producing regularly, but the weight of its indebtedness has dragged it down to insolvency.

It is understood that the Canadian Gowganda Company will this spring instal a considerable plant at the mine. The Canadian Gowganda found a small pocket of high-grade ore, took it out and shut down till it could resume operations on a larger scale.

At Gowganda there are signs of a slight revival. The Mann on the West Ridge is taking out some remarkable ore from an old open cut and an American company has acquired the O'Brien property and the Burke Remey claims with a view to development this year. The Temiskaming and Hudson Bay Company is taking in a large supply of provisions for operations at its property at Hangingstone Lake, and the Powerful Mining Company is producing good ore from its property at Calcite Lake. The Miller Lake O'Brien is making a shipment of high-grade ore every six weeks, and the Millerett is despatching concentrates and mine ore at regular intervals. The camp is now in urgent need of $27,000 from the Government to patch up the road between Elk Lake and Gowganda. The mine managers state that if this money were economically spent it would be sufficient to cut down freight rates from $30 a ton to $10.

BRITISH COLUMBIA.

Two months of the New Year have passed, and now that the worst of the winter weather is over the opinion that mining activity will be general is being confirmed.

In East Kootenay, the largest production of ore from the metal mines may be expected from the Sullivan Group mine, near Marysville, which is controlled by the Consolidated Mining and Smelting Company, and at which much new machinery and plant was added to the mine equipment last year. A comparatively small production of lead concentrate may be expected from the St. Eugene, while the Aurora and Society Girl are also likely to ship some ore. It is hardly probable the construction of the Kootenay Central Railway will be sufficiently advanced to induce the owners of mines in Windermere division to resume productiou this year. Some notes on the Monarch mine, in Northeast Kootenay are given below. Coal mining should be on a larger scale than in earlier years, provided no interruption shall take place to restrict output.

In West Kootenay the outlook is promising in Ainsworth, Slocan, Nelson, and Trail Creek divisions. Among the operating mines in Ainsworth division are the No. 1 and Tiger, which the Consolidated Company is working; those of the Mabry Syndicate and Silver Hoard Company, respectively; Mr. A. D. Wheeler's Gallagher mine; and the Krao Group, owned by a company having its headquarters in Butte, Montana. The Blue Bell is again being worked after more than a year's inactivity, while the Utica and the properties of The Deep Mine, Ltd., and Retallack

& Co. (formerly the Whitewater Group) should also be at work. It is probable, too, that work will be again done on several properties situated up the valley of the south fork of Kaslo Creek. In Slocan division, the Lucky Jim, near Bear Lake; the Rambler-Cariboo, Rambler-Cariboo Extension, and Rio, all in McGuigan basin; the Payne, Slocan Star, Ruth-Hope, and Richmond-Eureka, near Sandon; the Noble Five Group, Twilight, Reco, Sunset, and Surprise, all above Cody Creek; the Standard, Van-Roi, and Hewitt-Lorna Doone group, in Four-mile camp; the L. H., a few miles from Silverton; the Eastmont, the Lily B., and several other mines in Slocan City division; together with a number of other mines in different parts of Slocan, will all be worked, some continuously throughout the year and the remainder during such period as work shall be reasonably practicable. Then in Nelson division, the Molly Gibson mine and concentrating mill, will be regularly operated by the Consolidated Company; the Granite-Poorman gold mines and 20-stamp mill are expected to increase their output; the Silver King and other mines of the Lennie-Rand Syndicate, are to have development work done on them; several mines in Ymir camp, and others at Erie, will be among the working properties; while about Salmo, the Emerald lead mine, and several promising prospects will also have attention. The gold mines—Queen, Mother Lode, Nugget, Kootenay Belle, and others—of Sheep Creek camp, also in Nelson division, should together make a larger production than in any previous year. In Trail Creek division, the several regular producers near Rossland—the Centre Star group, Le Roi, and Le Roi No. 2 group—with a small output from two or three mines in the South Belt region, may be expected to make a better showing on the whole than that of several recent years; and the Consolidated Mining and Smelting Company's copper and lead smelting works and lead refinery at Trail, are likely to have a busy year.

The copper mines of the Boundary district—those of the Granby, British Columbia Copper, and New Dominion Copper Companies—will probably make the largest total output this year the district has ever made. The smelteries at Grand Forks and Greenwood, respectively, having a combined treatment capacity of between 6,000 and 7,000 tons of ore a day, are expected to turn out a larger total quantity of copper in 1912 than in any previous year in their history. The small mines of this district having high-grade ore are unlikely to add much to the production of the year, though several of them may be worked. The construction of the Kettle Valley Railway may not be far enough forward to allow of shipment of ore from several small mines up the west fork of Kettle River before next year, so these may hardly be regarded as probable producers in 1912.

Notes on several individual properties in different parts of the province follow. Taking all these mines, and the coal mines of Nicola and Vancouver Island, it would appear that, as has already been stated, there is good reason to look for much mining activity in the province.

Field-Golden Division.—The Mt. Stephen Syndicate, which commenced operating its concentrating plant early in January, was unable to make much concentrate that month, owing to the water freezing and power for driving the mill machinery being consequently cut off. In February, though, the mill was running practically the whole month. Two more jigs have been added to the equipment. The products are a lead and a zinc concentrate. The latter is nearly clean zinc, ranging up to 55 per cent. spelter, but averaging 45 to 50 per cent. The first car of zinc concentrate is ready for shipment; this will probably be sent to reduction works in the United States, prices and terms offered by zinc-buying firms in that country appearing more advantageous to the mine owner than those quoted by old-country buyers. It is expected that by the end of March the treatment capacity of the mill will be up to about 60 tons of ore a day, and that the daily output of concentrates will be 10 to 12 tons. There is a considerable quantity of ore available, and it is hoped that hereafter production will be regularly maintained, operations in both mine and mill being supervised by experienced practical men. Mr. I. J. Crothers is mine superintendent, and Mr. Ed. Milward mill foreman.

Similkameen.—The Hedley Gazette reports an increase of tonnage of ore crushed and treated at the Hedley Gold Mining Company's 40-stamp mill. It is expected the company's report and statements of accounts for the calendar year 1911 will soon be made public. While it will doubtless be read with much interest, when it shall be published, its main facts are already known, namely, that approximately 57,000 tons of ore was mined and put through the mill during the year, and that between $300,000 and $320,000 net profit was made, of which $300,000, being 25 per cent. on the issued capital of $1,200,000, was paid to shareholders as dividends and bonuses.

Other properties in Hedley camp that are having attention are the Apex group, under working bond to Mr. T. A. Pickard and others; the Sacramento and Kingston groups, be operated by C. H. Brooks and associates; and the Oregon, on which more development is being done.

The British Columbia Copper Company is continuing the development of the Voigt Group, on Copper Mountain, a few miles from Princeton; The Princeton Coal and Land Company has been busily engaged installing a new coal-handling plant and making other substantial additions to its facilities for regularly maintaining an output of coal; and the Columbia Coal and Coke Company has been energetically preparing to make a considerable production.

Coast District.—The Britannia mine in larger and the Marble Bay mine in smaller degree, are the only producing metalliferous mines in the lower part of the Coast district. As some information of these is given under another head, only this passing mention of them will be made here.

A company known as the Surf Inlet Gold Mines, Limited, is developing the D. L. S. group of claims, situated near Surf Inlet, Princess Royal Island. Late in 1911 Mr. Fred. M. Wells took up a well-equipped part of men to do more development work, and has since extended one of the tunnels about 200 feet. During 1910 Mr. A. B. Clabon and Mr. Wells, with some associates, acquired the D. L. S. group, on the Bluff claim, of which two parallel veins had previously been opened, chiefly by adits and a shaft. The adit on the upper, or west, vein was driven 140 feet, while the length of that on the lower, or east, vein was 293 feet. The shaft was commenced at an elevation of about 265 feet above the lower tunnel, and it was sunk 60 feet, which left a distance of 205 feet between the bottom of the shaft and the lower adit. The difference in elevation between the two adits is about 100 feet. The veins are stated to run more than 6,000 feet on their course through the claims. The ore varies in width, usually between 18 inches and 4 feet, though in places it has been found of much greater width. It is quartz with iron pyrites containing gold and a small quantity of silver. More development work was done in 1910, additional to that first above mentioned. The reports of several mining engineers who have examined the property indicate that, with proper development and suitable equipment, a profitable mining enterprise should be established here.

In Portland Canal district, the Red Cliff is reported to be the only property tributary to Stewart on which development work was continued throughout the winter. The Portland Canal Mining Company did not find it practicable to operate its concentrating mill, so it was closed for the winter. On Observatory Inlet, the Granby Company employed a number of men doing underground development in the Hidden Creek mine, but no important progress could be made towards carrying out the extensive surface improvements the company intends to have completed as soon as conditions shall permit of construction work being proceeded with.

STATISTICS AND RETURNS

SHARE MARKET.

(Courtesy of A. E. Bryant & Co.)

March, 19th, 1912.

New York Curb.

	Bid	Ask
B. C. Copper	4¾	4¾
Giroux	4⅜	4 7/16
Greene-Cananea	7½	7¾
Inspiration	19⅛	19⅜
Yukon Gold	3⅜	3½
Miami	24¼	24½
Tonopah	7¼	7½
Ray Cons.	17⅝	17¾
Chino	25⅞	26
United Copper	1¼	1¾
Utah	57¾	58¼

Cobalt Stocks.

	Sales Low	Sales High
Bailey	.02	..
Beaver Consolidated	.46½	.47
Buffalo	*1.40	..
Chambers-Ferland	.13	.13¾
City of Cobalt	*09½	..
Cobalt Lake	.28	..
Coniagas	7.10	..
Crown Reserve	3.21	3.26
Great Northern	.10	..
Gould	*.02½	..
Gifford	*02	..
Green-Meehan	.01⅜	..
Hargraves	.06	.06¼
Kerr Lake	..	**3.00
La Rose	3.84	..
McKinley-Darragh	1.84	..
Nipissing	7.65	..
Nova Scotia	..	**.05
Ophir	.08	..
Otisse	..	**.01
Peterson Lake	*.07	..
Rochester	..	**.02½
Right of Way	.08¾	.09
Silver Leaf	.05	.06
Temiskaming	.34½	.34¾
Trethewey	..	..
Wettlaufer	.73	.74

Porcupine Stocks.

	Low	High
Apex	.06½	.07
Dobie	.50	..
Crown Charter	.18	..
Dome Extension	.48	.49
Eldorado	.06½	..
Foley-O'Brien	.34	..
Hollinger	10.70	11.00
Jupiter	.44	..
Moneta	..	**.18
N. Ont. Exp.	..	**.43
Pearl Lake	.18	..
Porcupine Central	3.90	3.92
Porcupine Imperial	.05	.05¼
Porcupine Northern	1.05	1.08
Rea	.89	.91
Standard	..	**.20¼
Swastika	.23	.24

*Bid, **Offered.

	Low	High
Vipond	.44½	.45
United	.02⅜	.02¾
West Dome	.52½	.53

Sundry.

	Low	High
Island Smelters	.09	..

SILVER PRICES.

	New York cents.	London pence.
February 21	58⅞	27 1/16
" 22	Holiday	27 1/16
" 23	58⅝	27
" 24	58½	26 15/16
" 26	58½	26 15/16
" 27	58½	26 15/16
" 28	58⅞	27⅛
" 29	58⅝	27
March 1	58¾	27 1/16
" 2	58⅞	27⅛
" 4	58⅝	27
" 5	58⅛	26¾
" 6	58⅜	26⅞
" 7	58⅜	..

TORONTO MARKETS.

Metals.

March 11.—(Quotations from Canada Metal Co., Toronto.)

Spelter, 6.85 cents per lb.
Lead, 4.25 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.75 cents per lb.
Electrolytic, 14.75 cents per lb.
Ingot brass, 7 to 12 cents per lb.

March 11.—Pig Iron.—(Quotations from Drummond, McCall & Co., Toronto.)

Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼ inch lump.

Coke.

March 7.—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, $1.85 to $1.95 per ton.
Foundry coke, prompt, $2.20 to $2.50 per ton.

March 7.—Tin, straits, 42.80 cents.
Copper, Prime Lake, 14.62½ cents.
Electrolytic copper, 14.55 cents.
Copper wire, 15.00 cents.
Lead, 4.00 cents.
Spelter, 6.90 cents.
Sheet zinc (f.o.b. smelter), 8.25 cents.
Antimony, Cookson's, 7.25 cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $46.00 for 75-lb. flask.

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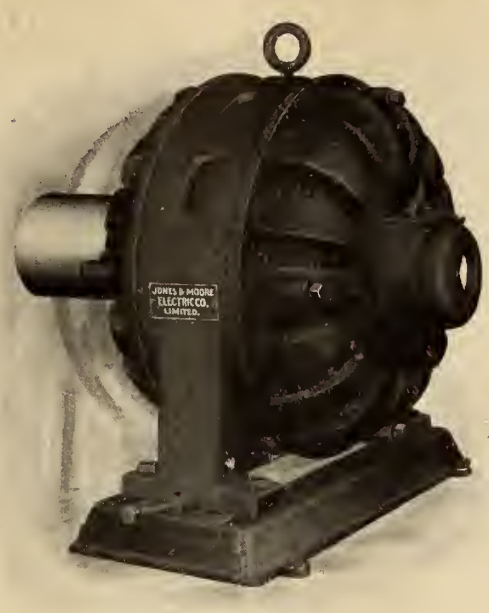

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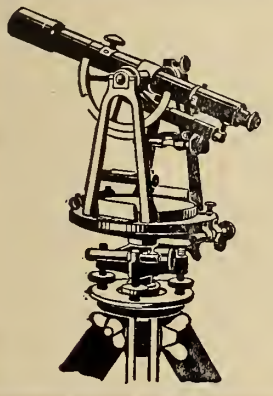

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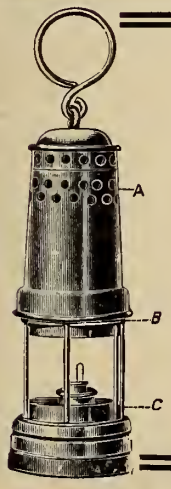

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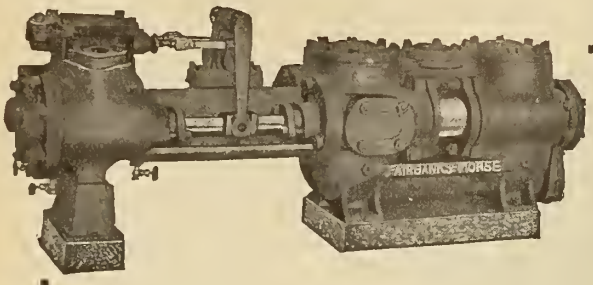

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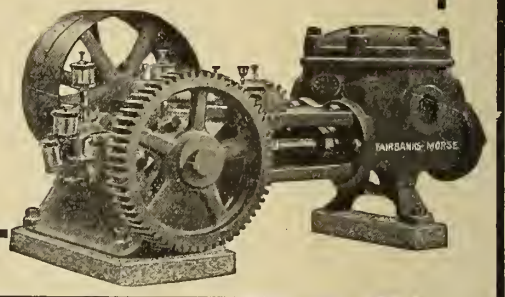

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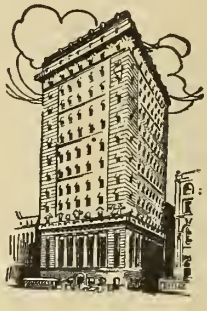

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PUBLICATIONS

The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

ONTARIO.

1137. Memoir No. 10. An instrumental survey of the shore-lines of the extinct lakes Algonquin and Nipissing in South-western Ontario, by J. W. Goldthwaite.

NORTH WEST PROVINCES.

1115. Memoir No. 8. The Edmonton Coal Field, Alberta, with maps, by D. B. Dowling.
1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

BRITISH COLUMBIA

1139. Memoir 11-T. Triangulation and Spirit Levelling of Vancouver Island. 1909, by R. H. Chapman.

YUKON and NORTH WEST TERRITORIES

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.
1130. Memoir No. 9. Bighorn Coal Basin, Alberta, by G. S. Malloch, accompanied by a map.

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1042. Mineral Map of Canada. Scale 100 miles to 1 inch.
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1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

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1066. Map 18A. Lake Timiskaming Mining Region. Scale 1 mile to 1 inch.
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1180. Map 34A. Vicinity of the National Transcontinental Railway between the counties of Levis and Temiscouata, Quebec. Scale 8 miles to 1 inch.

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1091. Map 8A. Lake Nipigon, Thunder Bay District, Ontario. Scale 4 miles to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

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792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.
1198. Map 48A. Tulameen Coal Area, Yale District, B.C. Scale ½-mile to 1 inch.
1135. Map 15A. Phoenix, British Columbia, topographical. Scale 400 ft. to 1 inch.
1136. Map 16A. Phoenix, British Columbia, geological. Scale 400 feet to 1 inch.
1148. Map 20A. Victoria sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.

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BRITISH COLUMBIA

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Has produced Minerals valued as follows: Placer Gold, $71,213,103; Lode Gold, $60,811,067; Silver, $31,095,602; Lead, $24,645,605; Copper, $60,743,405; Other Metals (Iron, Zinc, etc.), $1,083,172; Coal and Coke, $114,012,596; Building Stone, Brick, etc., $10,593,100; making its Mineral Production at the end of 1910 show an

Aggregate Value of $374,197,650

In 1910 the quantity of Ore mined was 2,216,428 tons, and of coal 3,139,235 long tons. The value of Minerals produced that year was: Placer Gold, $540,000; Lode Gold, $5,533,386; Silver, $1,245,016; Lead, $1,386,350; Copper, $4,871,512; Coal and Coke, $11,108,335; Other Minerals, $1,692,473, making the

Total Value for 1910, $26,377,066

Lode-mining has only been in progress for about eighteen years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

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Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. W. H. HEARST,

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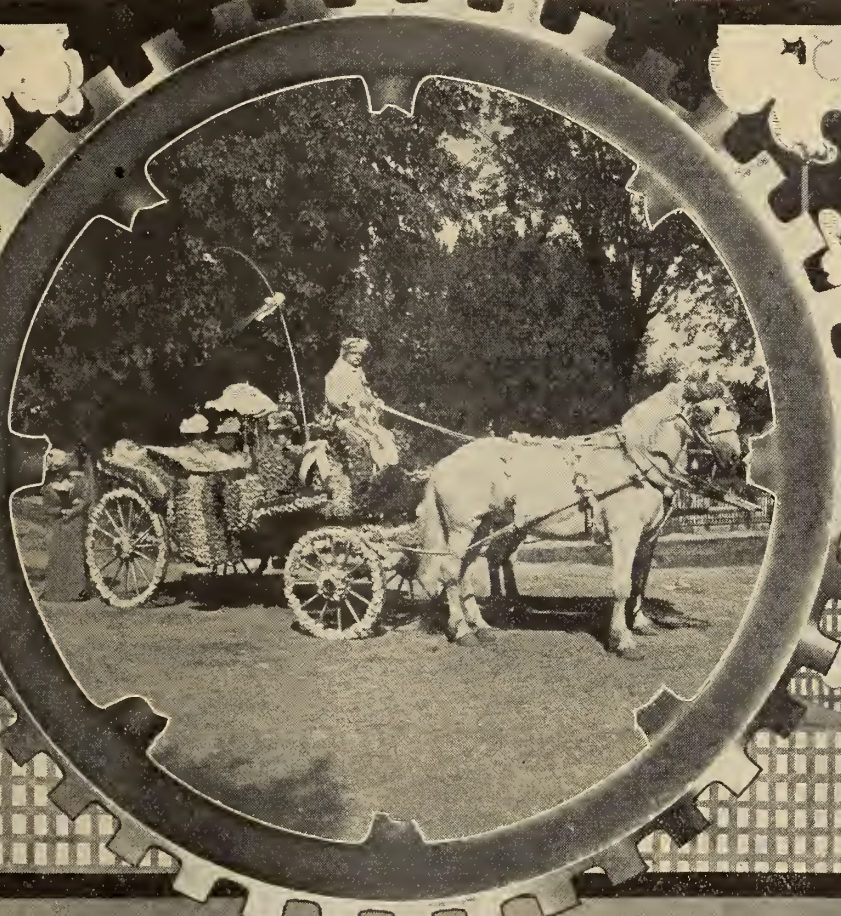

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Its base consists of felt made of ***stone***—pure ***Asbestos***. And Asbestos is a natural ***rock*** formation. Like all rock or stone, practically everlasting. And known the world over as fire-proof. It is the same material that is used to hold the flame in gas grates—the same material of which we make Asbestos Theatre Curtains. You know Asbestos Curtains are required by law, a protection against fire, in the theatres of nearly all cities.

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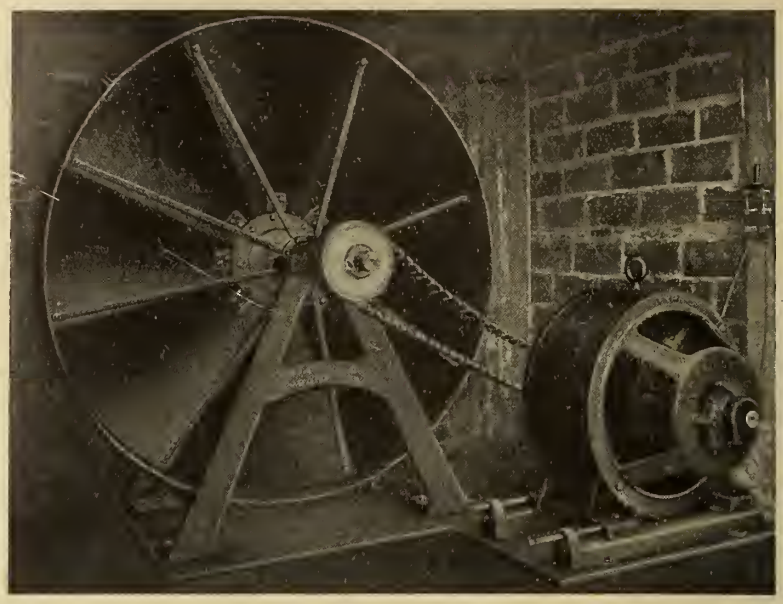

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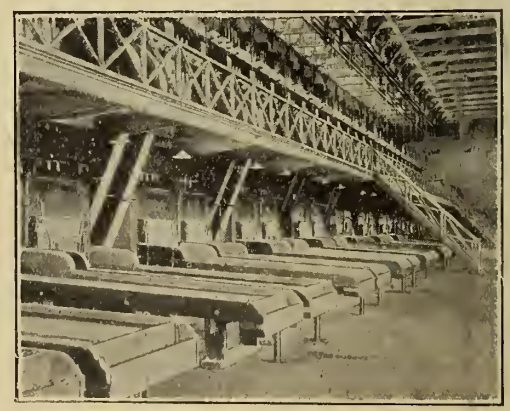

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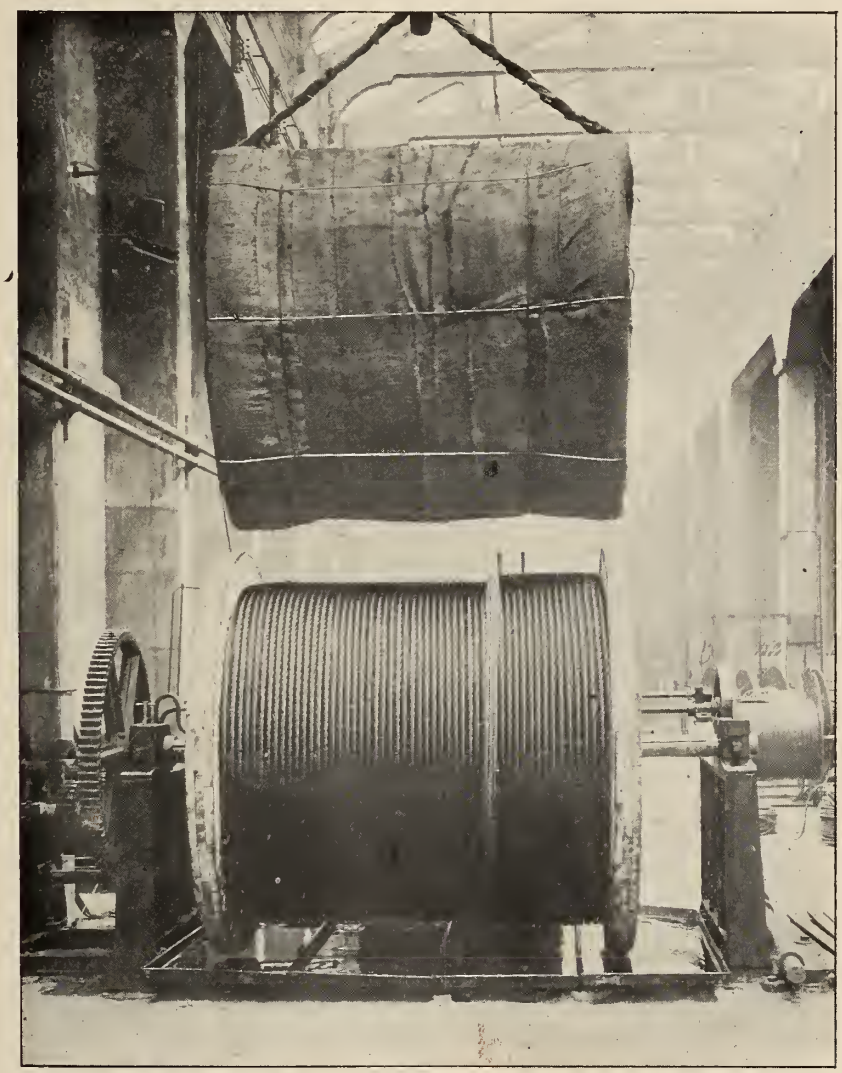

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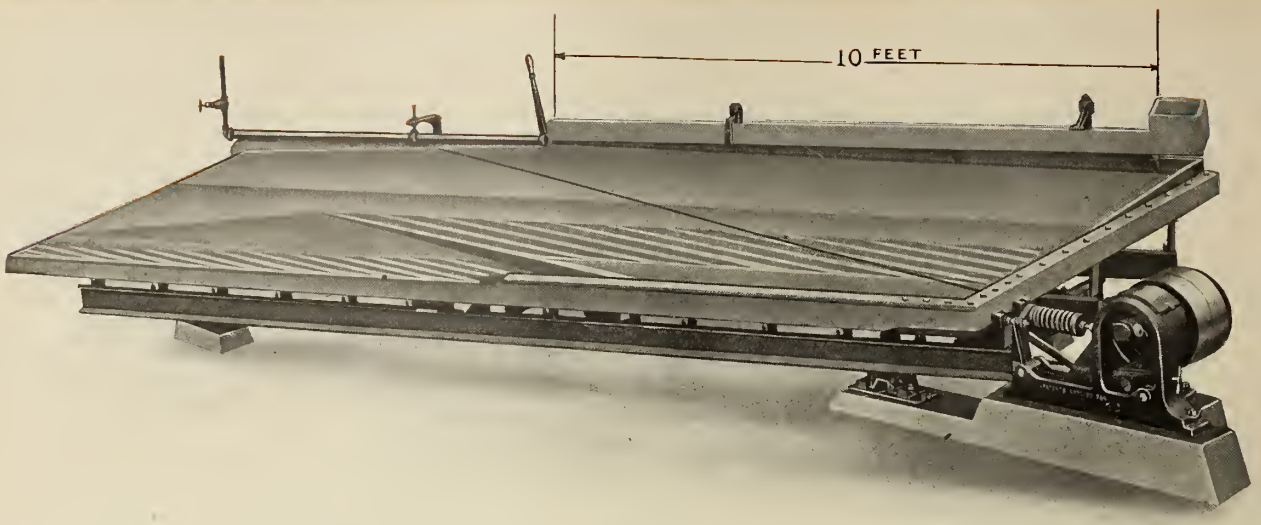

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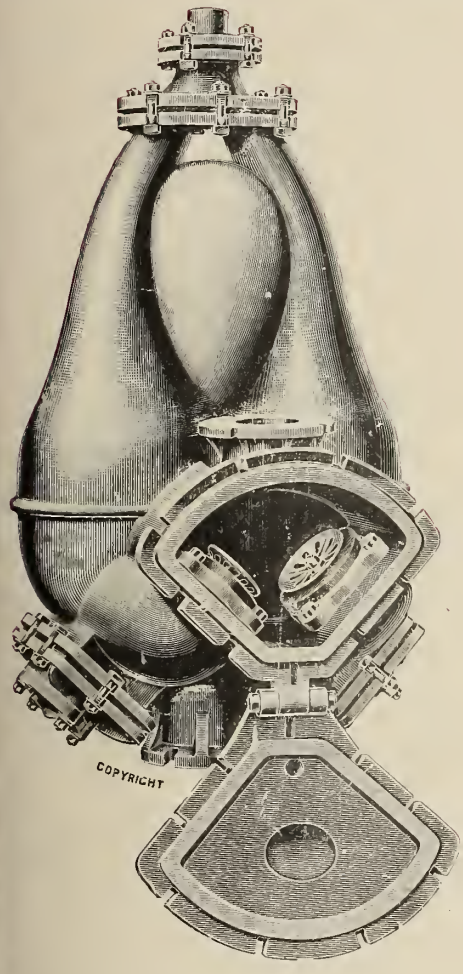

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The big No. 21 "K" Crusher in Laurin & Leitch's plant, Montreal, weighs 225 tons, stands 25 feet high, and has a capacity of 1,000 tons per hour.

For full particulars of these crushers see Bulletin 1441. The sample grinder is described in Leaflet 2036.

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Fastest Boring Hand Hammer Drill in the World (in Rock or Coal)

Has Automatic Rotation Device

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The "Simplex" Only Weighs 30 Pounds

Its air consumption is very low and being made from the Finest Sheffield Materials, repairs are reduced to a minimum.

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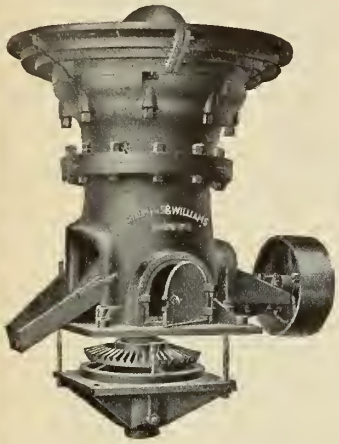

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Sounds like revolution, but it is only evolution in the manufacture of an improved type of this crusher. It would be economy to adopt this suggestion on account of the low 1st cost, the saving in power, the low cost for repairs, and the increased capacity.

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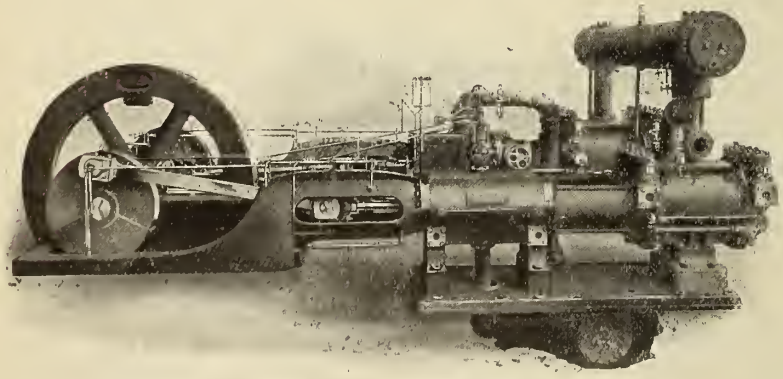
Is the Standard Compressor of the United States Navy Department



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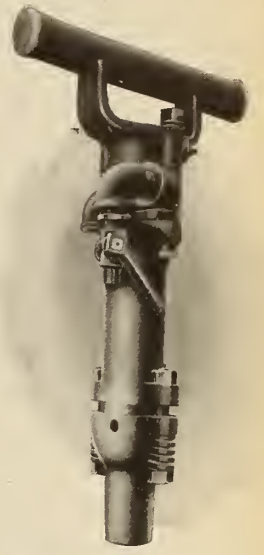
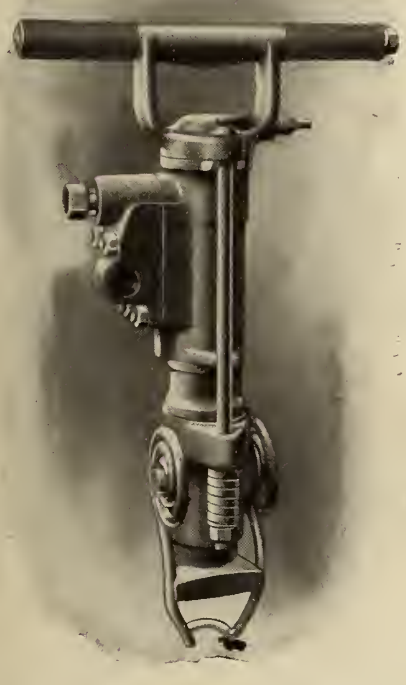


"B A 23" Hammer Drill—with broad tee handle. Weight 43 pounds

Rand Butterfly Valve Hammer Drills are "ONE MAN" DRILLS. By doing your rock drill work with these tools every man becomes a producer. There are no drill helpers—no non-productive drill laborers.

AS NO MOUNTING is required with hand hammer drills and as the steel fits loosely in the chuck every minute is devoted to profit-earning drilling. No time is lost setting up in changing from one hole to another nor in changing steels. Average time for changing steels 10 to 30 seconds.

The first cost of a "Butterfly Valve" hand hammer drill is much less than the first cost of a piston drill. This will have one of two effects on rock drilling costs. It either reduces the amount invested in plant and consequently reduces interest and depreciation charges, or, for the same investment it provides for more equipment with a corresponding increase of your output.



"Rand Steam Plugger" with Automatic Rotation of Steel.

Less Power "Butterfly" Valve Hammer Drills require much less power than piston drills. Therefore the necessary power plant (boiler, air compressor, etc.) is very much reduced. Reducing power plant also reduces maintenance, depreciation and interest charges. Combining the saving in labor and saving in fuel or power with the lower cost of drills and plant very much reduces drilling costs.

JUST THINK THIS OVER

A Drill Runner Without a Helper Reduces Labor Cost.
A Saving in Time Means Lower Labor Costs.
A Saving in Plant Investment Means Lower Interest and Depreciation Costs.
A Saving in Power Means Lower Fuel Costs.
The Minimum of Breakages and Repairs Means Low Upkeep Costs.
Increased Drilling Capacity Per Man Means Larger Output at Lower Labor Costs.

All these factors combine to give a **Low Cost Per Ton of Rock Removed or Per Foot of Hole Drilled.** They can all be effected by the use of "Butterfly" Valve Hammer Drills.

Let Us Go Into Your Drilling Problems With You.

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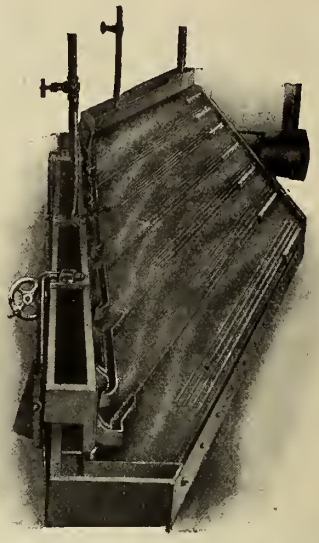
Improved No. 3 Deister Slime Table.



No. 4 Deister Sand Table.

Deister Improved No. 3 Slime Table for classified and unclassified feeds of 80 mesh and finer only.

Deister No. 4 Sand Table, better adapted to feeds from 8 to 80 mesh, classified or unclassified, than any device on the market.

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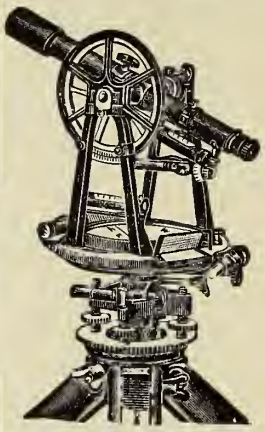

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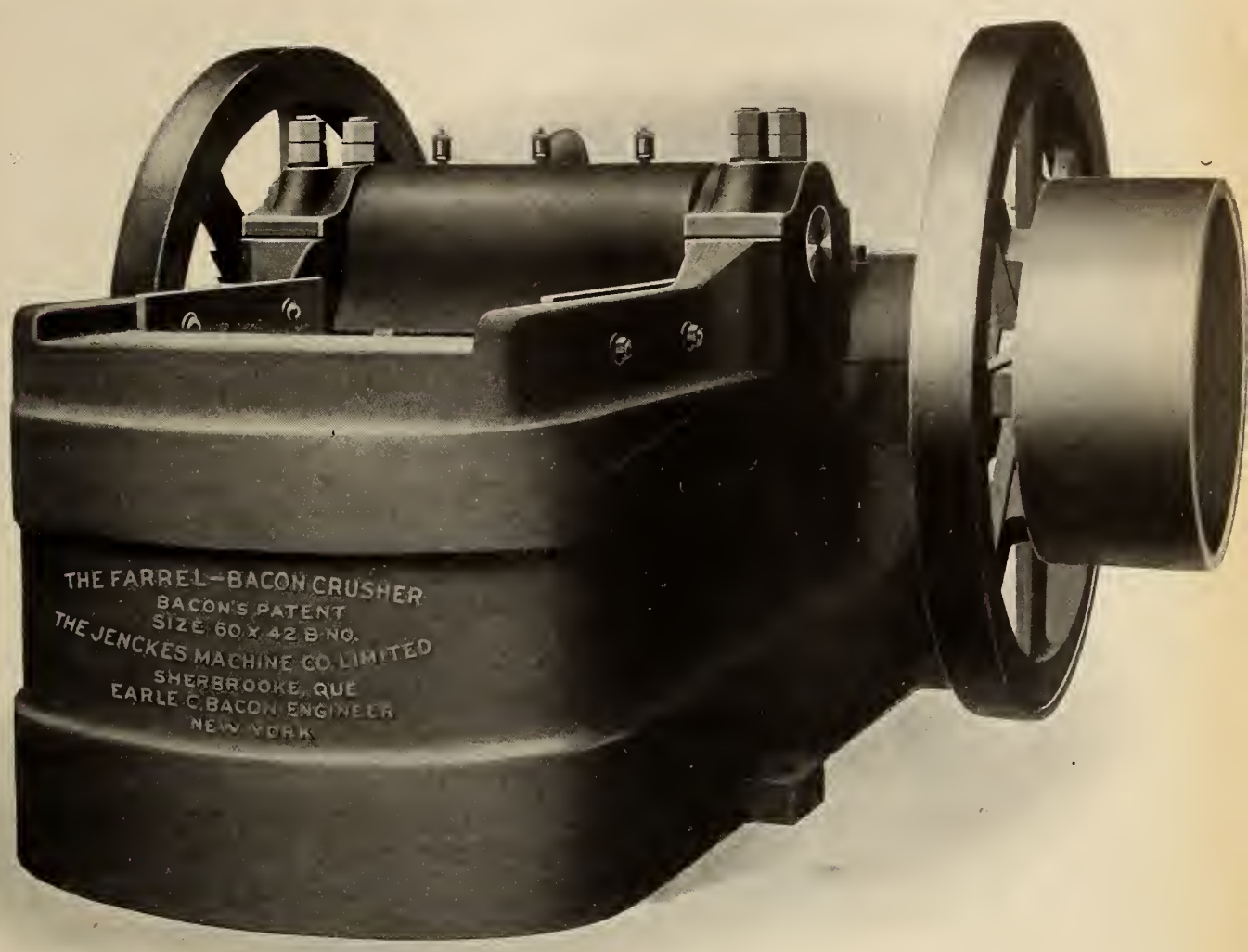

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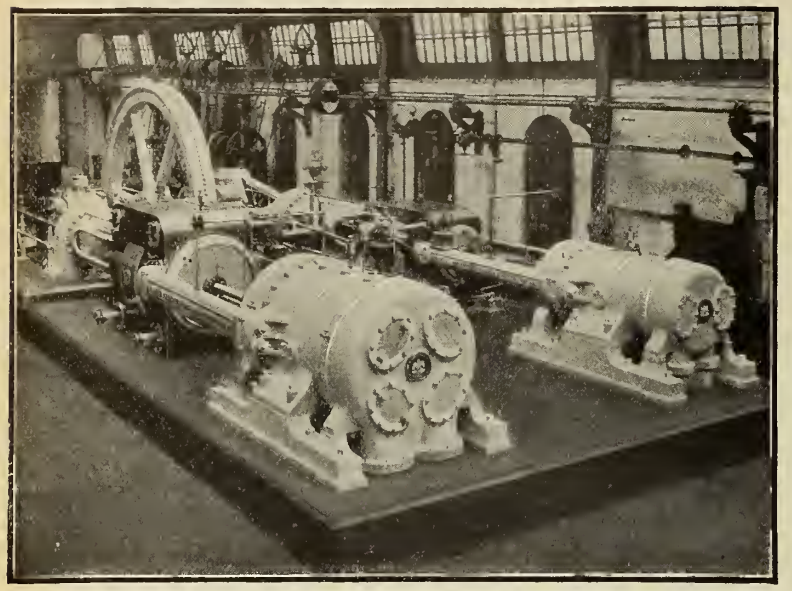

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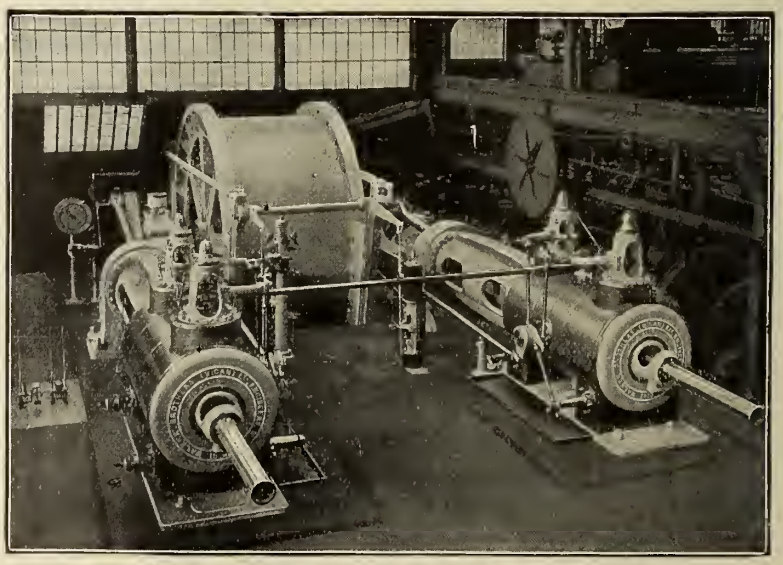

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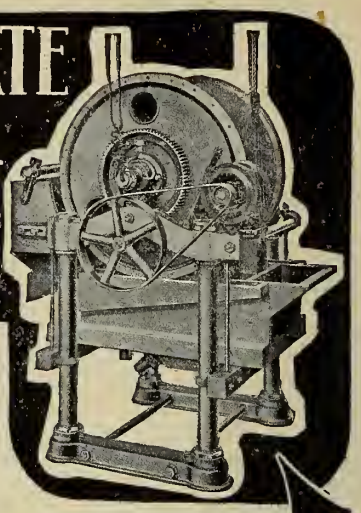

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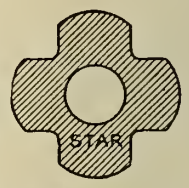

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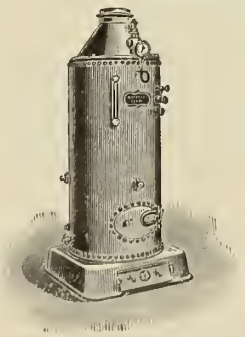

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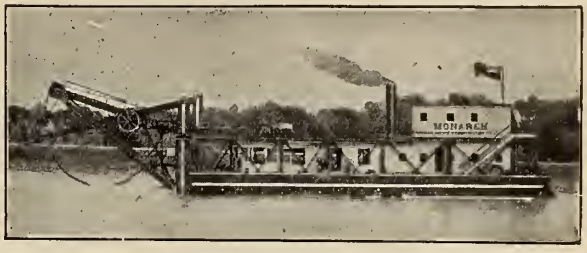

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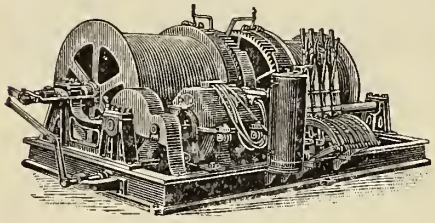

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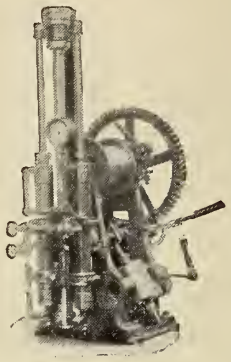

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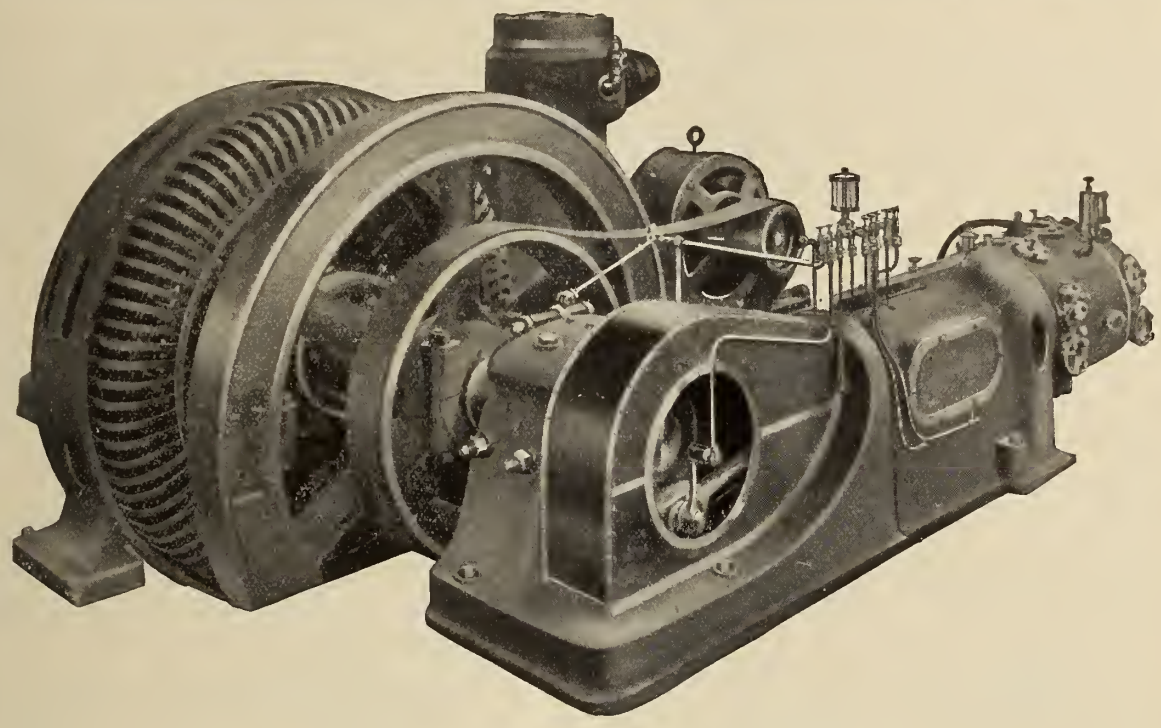

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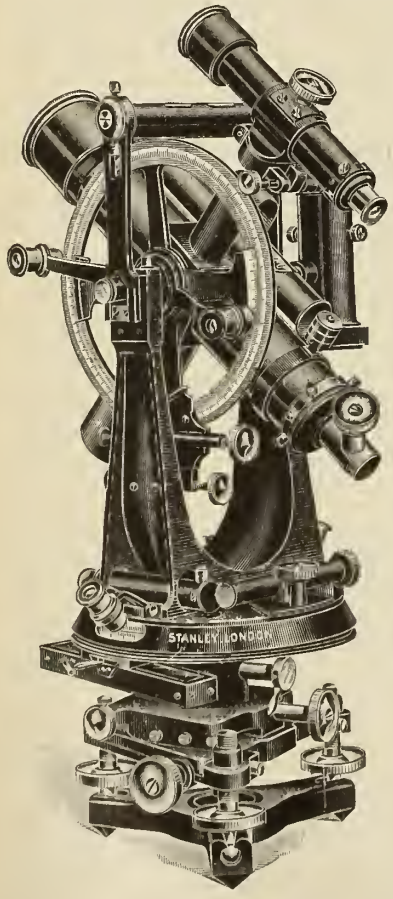

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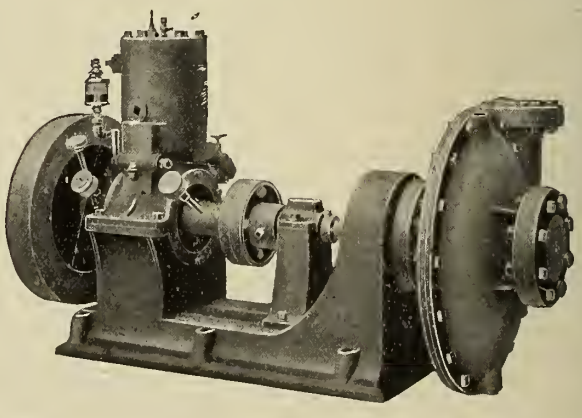

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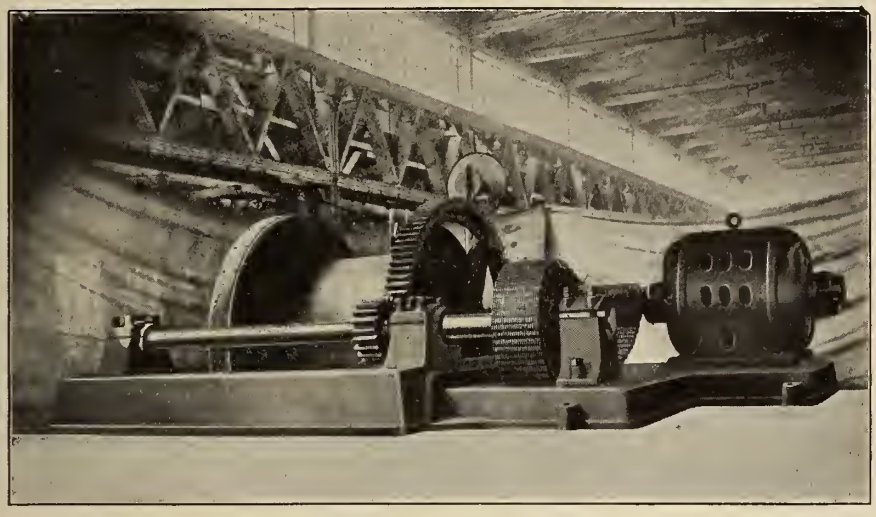

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, April 1, 1912. No. 7

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ANNOUNCEMENT.

The Canadian Mining Journal desires to interest the mining student and young mining graduate in the work of building up Canadian mining literature. To this end we make the following offer:—

To the student in the third or fourth year of his course in mining engineering, or in metallurgy, who sends in the best essay on any appropriate technical subject we shall award a prize of one hundred dollars ($100). The judges will be the Editor of the Canadian Mining Journal, and several professors of mining and metallurgy from Canadian colleges.

Fuller details will be given in a later issue. It may be borne in mind, meanwhile, that the offer is open to all students taking mining or metallurgical courses in Canadian institutions. It is understood that the subject matter of the essay must be distinctively Canadian. Manuscripts that do not attain the highest mark, but that are of sufficient interest to be published in these columns, will be paid for at current rates.

MINING ACCIDENTS IN ONTARIO IN 1911.

The Ontario Bureau of Mines has issued a bulletin covering the record of mining accidents throughout the Province during the past year. The bulletin was written and the figures compiled and analyzed by Mr. E. T. Corkill, Chief Inspector of Mines. It is an excellent piece of work, marking a new level of thoroughness, and reflecting credit upon the Bureau and upon the Chief Inspector.

From the exhaustive tables included in the bulletin we observe that 49 fatalities occurred in mines, quarries, and metallurgical works during the year 1911. As the number of persons employed numbered 14,543, the fatal accidents per 1,000 employees work out at 3.37. This is a lower figure than has been reported since the year 1907.

Of the 49 fatal accidents, 36 occurred in connection with mining.

More deaths were due to the careless handling and use of explosives than to any other cause. Almost half of the mining fatalities were traceable to premature explosions, drilling into missed holes, and explosion of dynamite while handling. Thus 16 of the

36 deaths fell into this class. Two persons were killed by falls of ground, eight in shaft accidents, seven in miscellaneous accidents, and two by the blowing up of a thawing house. Mr. Corkill classifies 38.9 per cent. of these fatalities as being "due to fault of the injured persons," while 72.2 per cent. (including, of course, the previous figures) can be placed at the door of managers and the workmen.

There is no statutory definition of the serious accident. For convenience sake Mr. Corkill has placed in the category of "serious" all accidents by which a miner was incapacitated for more than seven days. Of these there were 84 in Ontario mines during the year. Twenty-six of this total were surface accidents. From falls of ground four men were injured. Shaft accidents accounted for nine serious accidents; explosives for 10, and miscellaneous accidents for 37. Here again it is to be noted that nine men suffered for their carelessness in drilling or picking in old holes.

Among the specific acts of negligence on the part of mine managers are the following:—

Failure to erect and maintain approved thawing houses.

Failure to instal safety cross-heads.

Neglect of efficient scaling, of proper ventilation, and of enforcement of regulations as to riding in buckets, blasting missed holes, etc.

Neglect of maintaining auxiliary ladder-ways while sinking shafts.

On the other hand, the workmen sinned in the following respects:—

Careless handling of explosives.
Drilling into missed holes.
Irregular tamping.
Riding in buckets and skips.
Failing to keep shaft guard-rails in position.
Neglect of proper scaling of walls and roof.

As Mr. Corkill points out, the manager shares the responsibility with the careless workman when he fails to report promptly any breach of the provisions of the Mining Act.

The urgent need of means for testing and regulating the character of explosives is strongly emphasized. Careless storage, careless handling, and irregular use of explosives can be controlled to an extent. But it is practically impossible for the Inspector to take steps against the sale of dynamite that is improperly manufactured.

The bulletin contains strong recommendations as to the establishment of mine hospitals, particularly at Porcupine, where already the Dome Mines, Limited, has set a good example.

Accidents in metallurgical establishments, and in quarries are fully tabulated and analyzed.

Bulletin No. 9 is by far the most complete presentation of the year's accidents that has ever been issued in Canada. Its appearance in pamphlet form is a step in the right direction. Particularly to be commended is Mr. Corkill's effort to allocate generally the moral responsibility of each accident.

VERTICAL VERSUS INCLINE SHAFTS.

Mr. J. M. Nicol, writing in the latest bulletin of the Mexican Institute of Mining and Metallurgy, discusses the relative merits of vertical and incline shafts. His remarks are prefaced with the statement that there is in Mexico a general prejudice against the latter type. This holds for Canada as well. It is, therefore, appropriate to follow Mr. Nicol's argument. The metal mining field alone is considered.

Dealing first with prospecting, or exploration, shafts, the advantages of sinking to the dip of the vein are summed up as follows:—

The vein can be followed through every change of direction without the subsequent cross cut. The ore extracted lessens the expense of sinking. The work of sinking is easier owing to the more friable character of the vein matter as compared with the wall rock.

Against these advantages are to be set several disadvantages: First, more water is encountered usually in sinking on the vein, and during the sinking water is harder to handle than after fixed pumping stations have been established.

Second, sinking pumps are given hard duty, are difficult to repair, and may give serious trouble when handling water carrying sharp quartz grit.

Third, variations in the dip imply unfavourable hoisting conditions when sinking on the vein, and may render the shaft useless for later operations.

Fourth, if the ore body in which the shaft is sunk is large and valuable, either pillars of ore must be left or expensive timberings installed.

On the other hand, it is claimed that the vertical shaft can be driven more rapidly, timbered more easily, unwatered with greater facility, and that hoisting can be conducted with greater facility.

After thus summing up the pros and cons, Mr. Nicol proceeds to commend, for first exploration work, an incline shaft driven at a constant angle in the foot wall, only short cross cuts being required to tap the vein. This implies less pumping, and more rapid actual development. Further, stoping operations can be carried on at an early stage without entailing subsequent complications and loss.

For shafts sunk exclusively for drainage purposes, and these are most frequently necessary to unwater old workings, Mr. Nicol suggests the use of the core drill wherever possible, using air-lifts to extract the water.

Touching next on permanent shafts, designed for the handling of the mine output, the advantages of the self-dumping skip, as compared with the cage, are pointed out. Veins that are nearly vertical are, of course, not considered; nor are cases where there is

a series of more or less parallel veins. But where two veins, or series of veins, dip in opposite directions, two incline shafts, the collars side by side, can most economically be sunk, thus avoiding long cross cuts and underground haulage.

Ventilation shafts, where ventilation is the only object, can be sunk cheaply and expeditiously with a large core drill.

Mr. Nicol's paper, though incomplete, is highly suggestive. There are many Canadian mining districts where timely consideration of the suitability of the incline shaft not only would have saved much initial expenditure, but would have reduced later working costs. There are many limiting conditions of topography and geological structure that may force a decision one way or the other. Yet very frequently a choice is open. Too often no thought at all is given to the matter.

UNGAVA.

Ungava is in the air. Several expeditions are being organized to search for the rumoured placers. The infectious rumour of gold has caught the imagination of the prospector. While, very fortunately, there can be no rush, yet several men of means have arranged to send parties off to the north to spy out the land.

Now by a curious twist of fate we ourselves have seen a good deal of Ungava, at least of the shore line that bounds Hudson Bay on the east. Our recollection of the country, refreshed by re-reading voluminous notes taken during two summers, is distinctly discouraging. The geology of the shore line from latitude to latitude is simple. Unmetamorphosed sedimentaries, limestones, and quartzites probably of Cambrian age, overlain by trap, form several long series of islands and, in places, constitute the mainland. For the most part, however, the mainland consists of granite in the form of low-rounded hills, nowhere attaining the dignity of mountains. The topography and the physiography of the country apparently preclude the possibility of placers forming. The rivers are not large. They are, in the main, exceedingly rapid. Nowhere, so far as we know, has nature provided the pre-essentials. Nowhere are conditions favourable for littoral or estuarian concentration. Little known as Ungava is, it is safe to say that all ascertained facts are against the existence of placer gold deposits.

A further drawback is the difficulty of travel unless one has experienced white guides and Eskimo servants. Overland travel is practicable only over certain routes. Water travel is dangerous, especially to persons who do not know the country and the inhabitants.

It is not pleasant to write in seeming disparagement of any part of Canada. Our justification is that there is need of curing what appears to be a delusion. Ungava offers other chances to the hardy prospectors. Those who hope for placers may find an equivalent.

HOLLINGER AGAIN.

Our friend and contemporary, Mines and Minerals, than which no more edifying and careful periodical exists, has for once departed from the strict path of judicial impartiality. In its March issue appears a leading editorial on the Hollinger report. The moral inculcated by the editorial is sound. Unfortunately Mines and Minerals has gone astray in matters of fact.

Its arraignment of the report is based upon a paragraph quoted from the Cobalt Nugget. That paragraph runs thus: "Experience in similar rock formation in "other parts of the world has shown that the veins con- "tinue to depth of 1,000 to 2,000 feet, so that there can "be no doubt as to the conservatism of the estimated "depth of the Hollinger veins, none of which have been "estimated on a greater depth than 300 feet." Now this quotation is a loose paraphrase of a paragraph in Mr. Robbins' report, and does not represent either what he said or what he meant. Here is the text of the original: "It is probable that this vein will continue "to carry values to depths several hundred feet below "our present workings, and it is reasonably certain "that for the purpose of this report an allowance of "300 feet of depth for the entire vein will not lead "to any disappointments. Judged by past experiences "and results obtained in other pre-Cambrian fields in "other parts of the world, we may look for a continu- "ance of values to depths of over a thousand or fifteen "hundred feet, and the concensus of opinion among "engineers who have visited our property is that the "vein and values will persist to some such depths. "Academically this is a reasonable hypothesis, com- "mercially it is speculative and remains to be "proven."

Nothing could well be more cautious and rigidly professional than the language of this last paragraph. Of course, Mines and Minerals intended no injustice. But, as we have pointed out, it got hold of the wrong "dope." This mild correction is offered all the more readily since we are conscious of having committed errors of the same kind in the dim past.

Meanwhile enough has been written of the Hollinger report. The subject is hereafter taboo.

COAL STRIKES.

Strikingly dramatic is the reappearance of Mr. Balfour as leader of the Unionists. Unlike Mr. Roosevelt, Mr. Balfour came back at the urgent request of his successor. His task is to move the rejection of the minimum wage bill. Thus, to the embarrassments already

faced by the British Government is added the opposition of the Unionists led by the most consummate master of debate. With the whole force of the vested interests behind him, Mr. Balfour may succeed in blocking Mr. Asquith, and may, indeed, become the leader of a new Cabinet. But, whatever the issue, it seems probable that industrial peace is farther away than ever.

The British coal strike is slowly paralyzing transportation and manufacturing. The direct loss is incalculable. The indirect loss, even after work shall have become normal, will be enormous. The dislocation of the coal trade will affect the country for years to come. For instance, Great Britain exported to Europe 67,276,846 tons of fuel in 1911. This fuel had an average value of about $2.90 per ton. It can readily be appreciated that the temporary cessation of this export trade is tremendously costly, especially as Germany has built up a competitive export trade of nearly 30,000,000 tons, and is preparing further to command the market.

The serious plight of the British mine owner is obvious. There is little doubt that a minimum wage of some kind will have to be conceded to the men. It is equally true that a tentative measure, a measure that can be tried out for some years, is a necessity. This will give owners and men a chance to realize that in the long run their interests are identical. An overwhelming victory for either side would be a catastrophe. There must be a process of reconciliation and mutual adjustment of grievances.

The rumours of strikes in the United States will mean little if, meanwhile, peace is restored in Great Britain.

THE BRAKPAN SLIMES PLANT.

At the Brakpan mine, South Africa, there has been installed a slime plant that represents the last word in modern equipment. Four slime collectors, 65 feet in diameter by 12 to 17 feet in depth, are followed by six Pachuca tanks, 15 feet in diameter by 45 feet in height. Compressed air keeps the pulp in circulation in the Pachucas for four hours. After transference to the stock tank, the pulp gravitates to Butters vacuum filters. The filter plant is particularly interesting. Two filters of 168 leaves each, the area of each leaf being 80 square feet, present a total filtering surface of 27,000 square feet. Two double-cylinder, geared pumps, produce the vacuum. The solution is discharged into clarifying tanks, thence to storage tanks. The slime cake is dropped into a concrete sump, water is added, and after agitation, it is pumped into the slime dam.

The Brakpan ore, it may be added, carries about $6.75 gold per ton. Reserves of over two million tons were developed last May. Further reserves of about 900,000 tons carried about $2.15 per ton. The mill is equipped with 160 stamps of 2,000 pounds each. The stamp duty exceeds 12 tons per day. The whole plant is driven by electric power.

EDITORIAL NOTES.

The Dome mill at Porcupine was put into commission on March 21st. The visitors who attended the celebration on the 30th will, therefore, have seen a fairly seasoned plant.

La Rose quarterly dividend, increased from 2 to 2½ per cent., was declared on March 20th.

The International Nickel Company on March 19th declared a 7 per cent. quarterly dividend on its common stock, and a dividend of 1½ per cent. on its preferred. There are still symptoms of vitality about the corporation. Dr. David T. Day must revise his prediction of an early demise.

News comes from Gowganda to the effect that on the 250-foot level of the Miller Lake-O'Brien mine 200 feet of very rich ore has been developed. The vein here ranges between one and three inches in thickness, the ore carrying 5,000 ounces of silver to the ton. The mine has been shipping more than $30,000 worth of rich ore every six weeks. Gowganda has to be taken seriously.

The Nova Scotia Steel and Coal Company had a prosperous year in 1911. A slight decline in profits as compared with 1910, yet leaves the handsome sum of $1,019,392.51. Outputs of steel and iron were the largest on record. Coal production fell off slightly. Nearly $100,000 was added to the general reserve fund.

Cobalt is petitioning for a tavern license. At present the town is practically without hotel accommodation. It is believed by the petitioners that no hotel can survive without the sale of liquor. This, we think, is wrong. Legitimatized liquor selling in any mining camp is a mistake. It would be calamitous in Cobalt. On the other hand, a clean, well-managed hotel would undoubtedly succeed in Cobalt without liquor.

Whatever the intention of Prof. H. E. T. Haultain in his remarks before the Canadian Mining Institute, it certainly was not as represented in the newspapers. He had no dispute with anybody as to the depth of Porcupine deposits. His references were confined to a quite different subject.

CORRESPONDENCE

Montreal, March 20th, 1912.

To the Editor THE CANADIAN MINING JOURNAL,

Toronto, Ont.:

Sir,—I have read with attention the leading article in your issue of March 15th, commenting on the recent annual general meeting of the Canadian Mining Institute. The tone of the article may appear to be laudatory; but, it seems to me, that rather than depart from the attitude you have consistently assumed when discussing the affairs and policies of the Institute, you here garnish your dish of praise with the strong spice of criticism, cleverly enough disguised and served up in the sauce of fatherly advice. Criticism is only justified when it has a constructive excuse; mere captiousness is always despicable. I am, however, prepared to give you credit for the higher motive. But since your article may convey to those of our members who were not in attendance a false impression as to the manner in which the meeting was conducted and suggest to them that it was less successful than it actually was, I propose, with your permission, to analyze the suggestions you are pleased to put forward that others may judge whether or not they are so essentially vital.

First, then, you remark that "the paucity of the discussion was marked, although what discussion there was reached a remarkable pitch of interest." In other words, only men who had something to say worth while to say gave expression to their views. I am inclined to think this is a matter for profound congratulation. Time at our meetings is limited and valuable. There is none to waste on that which is not profitable. Discussion, if not to the point, is not profitable. Mr. T. A. Rickard, on page 130 of this issue of The Journal, emphasizes the fact that the discussion was unusually to the point. Since the chairman did his utmost to encourage discussion, the inference is that members having nothing profitable to add to what had been already contributed wisely kept silent. Thus was time conserved for other profitable business.

Your next suggestion is "that certain chosen papers should be printed and distributed to obviate the necessity of reading in extenso and to prime the audience." A good enough idea (if it were only original); but so far as practicable this course has been followed for several years past. It was also this year. Moreover, at the recent meeting not a single paper was read in extenso. Again, not a very vital nor necessary criticism.

Then you suggest that provision should be made for the sectionalization of certain hours of each session, etc., etc. That is a matter of opinion; but I don't believe you will find many to agree with you. The proof of the pudding is in the eating. There was not a session of the last meeting that was not crowded. There was no compulsion on any member to remain in the hall if he were bored with or not interested in the proceedings. Further, as a matter of fact, the papers were grouped according to subject. I refer you to the printed programme, the order of which was followed without deviation, except in one or two unavoidable instances. This also disposes of the criticism requiring "a clearer system of announcing the programme for each day." The programme is printed. Every member is supplied with a copy. In addition, the titles of papers to be presented at each session were duly bulletined. The possible use of a megaphone suggests itself; but, perhaps, you have matured some ingenious scheme, at once subtle and startling, which you will place at the disposal of future Organization Committees.

Your final suggestion to the effect that manufacturers of mining and metallurgical machinery should be encouraged to exhibit new devices or inventions at Institute meetings is at least debatable. But—and it is a big but—with the innovation you would certainly introduce an element of danger. The Institute, as you are aware, has hitherto been careful to discourage any attempt of commercial interests to take advantage of our meetings for the exploitation of their wares. It is a wise policy.

Well, I have discussed your suggestions, I think, with fairness. Is there so very much in them? These omitted, your article would have been more generous, less grudging. The gentlemen who were responsible for the arrangements and conduct of the meeting—I refer, of course, to those serving on the several local committees—are deserving of unstinted thanks, bestowed with both hands. Half-hearted commendation is worse than none. If I have misread your intentions, others will have done so also.

Yours faithfully,

H. MORTIMER-LAMB,
Secretary.

PERSONAL AND GENERAL

An event of interest to the geological fraternity was the marriage on March 2nd of Mr. Cyril W. Knight, assistant geologist of the Ontario Bureau of Mines, to Miss Grace Hewson, daughter of Judge Hewson, Gore Bay, Ont. Mr. and Mrs. Knight are spending their holidays in Bermuda, remote from mining camps and geologic disputes. They will return to Toronto early in April.

Mr. A. B. Willmott, mining engineer, Toronto, is spending some weeks at Killarney, Ont., organizing a stone quarrying business.

Mr. George R. Rogers, manager the Mann Mine, Gowganda, took a shipment of fourteen tons of high grade ore to the Deloro smelter early in March.

Mr. L. S. Arnold, mining engineer, 25 Broadway, Ne York, recently examined a mining property in Eastern Ontario.

Mr. Kehoe, mining engineer, Spokane, Wash., is in Toronto. Mr. Kehoe attended the C. M. I. Annual Meeting and was one of the party that visited Cobalt and Porcupine.

Dr. C. H. Shamol is engaged in a revision of his "Mining, Mineral and Geological Law," which is to appear soon. He requests that any readers who may have discovered errors, or have any suggestions for additional topics, communicate with him in care of his publishers, the McGraw-Hill Book Company, 239 West 39th St., New York.

Mr. E. J. Scovil, gold commissioner for Northeast Kootenay, has resigned after fifteen years of service.

Mr. E. Jacobs, our British Columbia correspondent, is visiting New York, Ottawa, and Montreal. He will return to Victoria early in April.

Mr. J. B. Woodworth, mining engineer, Lyndhurst Avenue, Toronto, has returned from a protracted visit to Arizona.

Mr. Stanley N. Graham, mining engineer, Toronto, has taken charge of the editorial department of the Canadian Mining Journal during the absence of Mr. J. C. Murray. Mr. Murray is on a short holiday trip.

Mr. Alex. Smith, manager of the Surprise mine, in Slocan district, British Columbia, has been spending part of the winter in Toronto.

Mr. H. H. Lavery, who at the beginning of February retired from the superintendency of the Monarch mine, near Field, B.C., was at Houghton, Michigan, lately.

Mr. C. H. Dickie, president of the Portland Canal Mining Company, and Mr. W. J. Elmendorf, its general manager, were in Toronto early in March.

Mr. M. K. Rodgers, of Seattle, Washington, was recently at the Nickel Plate mine, in Hedley camp, Similkameen, B.C., going thence to New York.

Mr. John L. Retallack, well-known as manager and part owner of several mines in Slocan district, British Columbia, is on a visit to England.

Mr. Irving R. Gard, mining engineer on the staff of the Canadian Collieries (Dunsmuir), Limited, has returned to Victoria, B.C., from a trip to the Eastern States.

Mr. J. A. Thompson, managing director of the Mt. Stephen Mining Syndicate, of Vancouver, B.C., has been spending several weeks personally supervising progress at his company's Monarch mine and newly erected concentrating mill near Field.

Mr. A. W. Constans, formerly manager of the Athabasca gold mine, near Nelson, B.C., is now manager of the Second Relief mine and 10-stamp mill, in Erie camp, also in Nelson mining division.

Mr. Thomas Kiddie has returned to Victoria, B.C., from a second visit to his son, John, who fills an important position on the mining engineering staff of the Arizona Copper Company at Morenci, Arizona.

Mr. Herbert Carmichael, Provincial assayer for British Columbia, was a recent visitor to San Francisco, California.

The Arlington mining property, situated in Erie camp, Nelson mining division, British Columbia, which for a number of years has made profits under the management of Mr. Leslie Hill, is being offered for sale.

Mr. Douglas C. Livingston, formerly with the Tyee Copper Company in British Columbia, and afterwards in Mexico for several years, read a paper at a recent meeting in Spokane of the local section of the American Institute of Mining Engineers. Mr. Livingston is now one of the professors in the mining engineering department of the University of Idaho, Moscow, Idaho.

Mr. R. R. Hedley left Toronto on March 17th on his return to Vancouver, B.C. After the close of the annual meeting of the Canadian Mining Institute he paid short visits to Montreal and New York.

Mr. E. Jacobs left Toronto for New York on March 21st, intending to proceed thence to Montreal and Ottawa before returning to Victoria, B.C.

Mr. W. J. Elmendorf, of Victoria, B.C., general manager of the Portland Canal Mining Company, was in Toronto for several days during last month in connection with a proposed amalgamation of several Portland Canal mining properties.

BOOK REVIEWS

Searchlights on Some American Industries—By James Cooke Mills—Illustrated—299 pages—Price $1.50 net—Published by A. C. McClung & Co., Chicago—1911.

An untechnical series of pleasant essays on certain great industries. The author has striven with varying success, but with unqualified assurance, to outline the vital facts necessary to the understanding of eight important branches of human activity. The order is a large one, too large indeed for one man to fill. Mr. Mills has done better than might have been expected. A native of Michigan, he has had an opportunity of studying at first-hand lumbering, salt-making, paper-making, and one or two other industries. These he has written up in a manner that is sometimes convincing, often exceptionally good, and not infrequently weak. In the main, however, his work is clear, conscientiously accurate, and logical. The chapter on graphite is well done, that on salt making also is a creditable performance. But the range of the book is too wide. The result is that one is conscious of much newspaperese.

Petrographic Methods—The authorized English Translation of Part I., Anleitung zum Gebrauch des Polarisationsmikroskops (third revised edition); and Part II., Die Gesteinsbildenden Mineralien (second revised edition)—By Dr. Ernst Weinschenk—Rendered into English by Robert Watson Clark, A.B.—396 pages—Illustrated—Price $3.50 net—Published by the McGraw-Hill Book Company, 239 West 39th St., New York—1912.

Although any addition to our already voluminous literature on petrography might appear superfluous, yet a brief examination of the book before us proves that it will fill its own chink in the library. Part I. of Weinschenk's original text has gone through three editions in Germany; Part II. through two editions. Mr. Clark's transcription into English is not a literal translation. It is a free rendering of the spirit and meaning of the original, and as such is much to be preferred to a servile following of the text.

As pointed out in the introduction, the microscope is not merely an instrument for magnification. Other optical adjustments are much more important. And with a foundation of mineralogical knowledge and full macroscopic data, the microscope becomes a highly efficient device.

The book is divided into two parts. Part I. opens with a description of the microscope. The adjustment of a polarizing microscope; observations in ordinary

light; observations in parallel polarized light; observations in convergent polarized light; and twins and optical anomalies, are the topics of this Part.

Part II. takes up the preparation of material; methods of separation; methods of investigation; development of rock constituents; and closes with a lengthy series of mineral species and determinative tables.

A glance over the pages of this treatise shows that it is modern to a degree. The clear exposition in Part I. and the lucid description in Part II. are outstanding features of the book. There is no evidence of superfluous or extraneous material. The scope is narrowed down to the essential.

It strikes the reviewer that the book is not only a good book to teach from, but is also a good book to read. It does not go into the abstruse mathematical phases of microscopy. But it covers fully the practical use of the microscope.

Observations on the West of England Mining Region —By J. H. Collins, F.G.S.—683 pages—18 folding plates—Printed for the Author by William Brendon & Son, Limited, Plymouth, England—1912.

Although privately printed, this substantial tome forms Vol. XIV. of the Transactions of the Royal Geological Society of Cornwall. Quite appropriately it is dedicated to His Royal Highness Edward, Prince of Wales and Duke of Cornwall. Like the author, we are His Royal Highness's most obedient servant, and we devoutly believe that the young man's whole course in life will be profoundly modified if he wades through the offering that is thus laid at his feet.

The mineral deposits and the economic geology of Cornwall, Devon, and Somerset are the author's subjects. The discussion of ore deposits, "regular fissure veins," "'carbonas," etc., is instructive though diffuse. Everywhere there crops out the quaint terminology of Devon and Cornwall. Elvans, Killas, flucan, prian, peach, are terms with which not all of us are familiar. But the reader also notes how largely the mining world has been supplied with names and variants by Cousin Jack.

Statistical addenda contribute to the value of the book, which is really a substantial, if ponderous, acquisition to our knowledge of English mining fields. The author has displayed enormous industry in collecting facts, and wide erudition in assorting and correlating them.

Symptoms of traditional insularity are not absent.

The Mining Manual for 1912—By Walter R. Skinner —A Record of Information Concerning Mining Companies, etc.—Twenty-sixth year of Publication —Established 1887—Price $5.00 net—London, 1912 —Canadian Mining Journal, Book Department, Toronto.

Not only are references and general information supplied for 3,160 mining companies, but a vast mass of personal and corporate information is also added in Skinner's Mining Manual. The 1912 edition contains over 1,500 pages, not including inserts. The enquirer who wishes to find out the record of the Bewick-Moreing people, the standing of the Consolidated Goldfields, the directors of the City of Cobalt Mining Co., or, in fact, any essential facts touching any mining company of English parentage or affiliations, will have no difficulty in turning up the right page in the Mining Manual.

As Canadian mining enterprises are becoming more and more interesting to English investors, and vice versa, as English capital is becoming more and more interesting to Canadian mining men (perhaps "divestors" is the correct antithetical term for "investors"), The Mining Manual becomes a greater necessity for the engineer, the lawyer, the writer, and the average citizen.

Apart from its value as a directory, The Mining Manual gives in brief the financial history of thousands of mining ventures. It is, therefore, an invaluable fount of facts concerning the economics of mining.

Annually we commend it to our readers. Our commendation is as hearty now as ever.

THE CANADIAN MINING INSTITUTE PORCUPINE TRIP

(Special Correspondence, by E. Jacobs.)

After the close of the fifteenth annual meeting of the Canadian Mining Institute, held in Toronto, Ontario, on March 6-8, a brief visit was paid by a few members of the Council of the Institute and their guests to some of the mines and reduction works in Porcupine and Cobalt districts, respectively. As is well known, these districts are in what is known as New Ontario. Cobalt is distant from Toronto by railway about 330 miles, in a northerly direction, and South Porcupine, the station on the Temiskaming and Northern Ontario Railway from which short trips were made to the Hollinger and Dome mines, is 148 miles farther up the line, this distance including the length of the branch line from Iroquois Falls to South Porcupine.

This excursion was arranged by the Council of the Institute, and it was made under the direction of Mr. H. Mortimer-Lamb, secretary of the Institute, who received much assistance from Mr. Arthur A. Cole, mining engineer to the T. & N. O. Railway Commission. The guests of the Council were: Mr. Theodore Dwight, New York, president of the Mineral Development Company, operating mines in Mexico; Mr. F. Lynwood Garrison, Philadelphia, consulting mining engineer; Mr. H. W. Hardinge, consulting mining engineer; Mr. W. R. Ingalls, New York, editor of The Engineering and Mining Journal; Mr. R. V. Norris, Wilkes-Barre, Pa., consulting engineer; Mr. T. A. Rickard, London, England, editor of The Mining Magazine; Prof. F. H. Sexton, Halifax, director of Technical Education for Nova Scotia; Mr. Henry Kehoe, mining engineer, Spokane, Wash.; Mr. E. Jacobs, Victoria, B.C., secretary of the Western Branch of the Institute, and Mr. Alex. H. Smith, South Porcupine, secretary of the Porcupine Branch. The Council of the Institute was represented by the following: Dr.

Willet G. Miller, Toronto, Provincial Geologist for Ontario, past-president of the Institute; Dr. A. E. Barlow, Montreal, president; Mr. R. W. Brock, Ottawa, director of the Geological Survey of Canada; Mr. Arthur A. Cole, Cobalt; Mr. Theo C. Denis, Quebec, Superintendent of Mines for Quebec; Mr. W. F. Ferrier, Toronto, mining engineer, and Mr. H. Mortimer-Lamb, Montreal, Secretary of the Institute. Colonel A. M. Hay, president, and Mr. Charles A. O'Connell, manager, both of the Trethewey Silver-Cobalt Mine, Ltd., were with the party from Toronto to Cobalt, and Mr. Ben Hughes, of the Toronto Globe, to Porcupine. The party travelled in the Pullman car Twilight, which left Toronto on Saturday night.

Hollinger Mine and Mill.

South Porcupine was reached on Sunday afternoon, a short stay having been made at Englehart en route, to see the contents of the green houses close by that station. The car was taken over the branch line to Timmins, four or five miles beyond South Porcupine, this having been the first time a passenger train was run to that station. The remaining two hours of daylight were spent in examining the incomplete 40-stamp mill and cyanide plant of the Hollinger Gold Mines, Limited, which were being hurried toward completion, the intention being to have these in regular operation as early in the spring as shall be found practicable.

The following is an excerpt from the first annual report of the Hollinger Gold Mines, Limited, dated January 15th, 1912:—

"**The Mill.**—It is obvious that milling costs can be reduced if the tonnage milled is increased, i.e., the standing charges, superintendence, supervision, general items of expense, etc., will be spread over a greater tonnage, and therefore the cost per ton will be reduced. It follows, then, that working upon a large scale it will be possible to mill ore profitably which would be unprofitable if milling were carried on upon a small tonnage basis. Our mill has, therefore, been designed with a view of treating ore from adjoining claims, for by so doing our costs will be reduced and a profit can also be made from milling purchased ore, which will further reduce the expense of the Hollinger.

"The initial mill will have a crushing capacity of 300 tons per day, while the cyanide plant will be capable of treating 500 tons per day. The extra capacity of the cyanide plant has been provided at the outset in order to avoid the complications and heavy costs of making additions later on, the installation of additional stamps being a comparatively simple matter.

"**Process of Treating Ore.**—Our original plan had been to crush and amalgamate and to concentrate the sulphides for future treatment, in a more or less incomplete mill, meanwhile conducting experiments to determine the most suitable methods of completing the process, Mr. A. G. Kirby, of Cobalt, having been retained as consulting metallurgical engineer.

"The fire of May 19, 1911, destroyed the 30-stamp mill then under construction and the impassable condition of the roads, coupled with the effects of the fire that swept the district on July 11, resulted in a complete setback to our work and necessitated a change in plans.

"Owing to the loss in time engendered by the above-mentioned causes, the proposed experimental work had of necessity to be curtailed, and some type of a permanent mill had to be decided upon, in order to take advantage of the remaining months of summer suitable for preparing the mill site. Accordingly a sample of ore was taken from the dumps and shipped to Mr. Kirby at Cobalt for experimental treatment.

"The net result of the tests was to show the necessity for fine grinding and also the advisability of extracting the concentrates for separate treatment.

"The process as decided upon is:—

"Coarse grinding.

"Stamping in cyanide solution.

"Tube milling.

"Concentration followed by amalgamation of concentrates.

"Cyanide treatment of both gangue and concentrate residues.

"The apparatus being installed consists of: A gyratory crusher, a jaw crusher, sampling plant, 40 1,500-lb. stamps, 4 Dorr classifiers, 4 tube mills, 5 ft. diameter by 20 ft. long, Spitzkasten, 40 Deister slimes tables, 4 Dorr pulp thickeners, 4 Trent agitators, 2 Moore filters, 2 Merrill clarifying presses, 2 Merrill precipitation presses, and the usual pumps, amalgamating pans, settlers, etc.

"The mill will be electrically driven throughout.

"When development work is more advanced and we have a more intimate knowledge of the low-grade ores, it is possible that part of the ore can be leached coarse, without the necessity of grinding fine and filtering, but this is a question which will have to be settled by experience.

"The mill being constructed will probably cost about $275,000, and it is hoped that everything will be in running order some time in April."

Underground at the Hollinger.

After supper in the mine boarding house, the visitors were taken underground, the mine maps having been first examined. About two hours were spent in the workings on the 100 and 200-foot levels, and much interest was evinced in the fine showings of ore seen. A very brief summary of the information relative to the mine given by the manager in the anual report follows.

The company owns four claims, and development work has been confined to a limited area on two of these. The mineralized area extends northeast and southwest, and covers practically the whole of three of the company's claims. Geologically, the richly mineralized belt is a shear zone of schist, probably formed from quartz porphyry, with considerable sericite occurring near the veins. The strike of the schist is generally southwest to northeast, while the quartz veins cut across this strike at a small angle more to the north and south. The schist is heavily mineralized with iron pyrite and, generally speaking, pyrite is disseminated throughout the quartz masses, being contained in the cleavages, particularly near the walls. The gold has evidently been deposited contemporaneously with, or a little later than, the pyrite, as occasional instances have been noted where the pyrite is encased in gold. Generally the occurrence of galena portends rich gold value, and to a lesser degree the occurrence of sphalerite is an indication of gold value. Large blocky crystals of pyrite are usually attended by low value in gold, while the finely crystalline pyrite occurs with relatively higher gold value. Scheelite occurs in small quantities. The schist walls of the main vein do not usually contain payable value, except

where contiguous to rich sections of the veins. Generally the southeast wall is the richer. In the quartz masses the occurrence of gold is extremely spotty. The quartz where streaked by fine lines of pyrite in the cleavages is generally more consistent in gold value than the clear masses having occasional spectacular showings of gold. The main vein is remarkable both for its gold content and its continuity. The ore shoot is unbroken for more than 1,000 feet horizontally and, while it varies in width from 2 to 20 feet, the wide lenses are usually the riches. The other veins are lenticular, consisting of chimneys and kidneys of quartz. There is no evidence of surface enrichment; the spectacular specimens found upon the surface are no doubt due to a local enrichment from the concentration of surrounding value. Generally speaking, the surface showings may be taken as indicating what may be expected at depth.

Some of the Veins.—In the manager's report mention is made of 36 veins in all. Some particulars are given of 5 or 6 of these, and the estimated tonnage and gold content of 9 others are stated, but the remainder, being of small size or low gold value, have been ignored for the time. An estimate of the tonnage of ore obtainable from six veins—allowing only for a depth of 300 feet on one, 200 feet on three, and 100 feet on two veins—gives 415,000 tons of ore having a gold content of 9,680,000; for nine other veins a total of 47,000 tons is allowed, of a value of $550,000; total, 462.000 tons, value $10,230,000.

No. 1 is the main Hollinger vein; it is exposed at the surface for about 900 feet and has an average width of 9.4 feet, and average gold value of $32.96 per ton; on the 100-ft. level the ore-body is continuous for more than 1,000 ft., has an average payable width of 8 ft., and an average assay value of $31.54 per ton; at the 200-ft. level, where less development had been done when the annual report was made, the average width was stated as 9.3 ft. and assay value $49.30 per ton.

No. 2 vein has been traced on the surface about 300 feet; its average width is approximately 7 feet, and assay value $7 per ton. It has been cross-cut on both the 100 and 200-ft. levels, and in places shows greater width and gives higher average value. The estimated possible tonnage down to 200 feet depth is 110,000 tons, having a gold value of $1,200,000.

Other veins, tonnage and value are: No. 3, 20,000 tons, $150.000; No. 4, 35,000 tons, $450,000; No. 8, 10,000 tons, $140,000; No. 12, 30,000 tons, $180,000.

The manager says: "To sum up—In the aggregate, the ore-bodies so far discovered will yield, for each 100 feet of depth, approximately 240,000 tons of ore, having a gross gold content of, say, $4,250,000, from which a net profit of $2,750,000 may be expected after allowing for operating costs and metallurgical losses. Vein No. 1 may be counted upon to a depth of 300 feet with certainty. Vein No. 2 promises a greater yield than has been estimated. . . . Veins Nos. 4 and 8 are stronger and richer at 100 feet than upon the surface, and although, in estimating, a depth of but 200 ft. has been allowed, ther is no reason to believe that these veins do not continue to much greater depth. No. 3 vein has spectacular showings which were avoided in sampling and hence may be expected to return a greater yield than that estimated. The other veins, classed as miscellaneous, are practically unknown quantities; they will no doubt exceed the estimate. It therefore seems reasonable to expect net profits amounting to more than $7,500,000 during the next four or five years, and beyond that there is the probability that profits will be continued at an undiminished rate, owing to the persistence of the various veins beyond the arbitrary allowances made in the accompanying estimates."

The total underground work in the Hollinger mine at the end of 1911 was 3,717 feet in the proportion of 575 feet of shafts, winzes and raises; 2,522 feet of drifting and cross-cutting on the 100-foot level, and 620 feet of similar work on the 200-foot level.

The main shaft is 4-compartment—three 4 by 5 ft. hoisting compartments and one 5 by 5 feet ladder and pump way. This shaft is to be sunk to a depth of 400 feet—it already connects with the 100 and 200-foot levels. Of the three other shafts, Nos. 1 and 3 are down to the 100-foot level, and a winze connects the 100 and 200-foot levels.

The Dome Mine and Mill.

The party returned to South Porcupine on Sunday night, after having heartily thanked the general manager of the Hollinger Gold Mines, Ltd. (P. E. Robbins) and his staff for their courtesy and attention. On Monday morning sleighs, provided by the local branch of the Institute, conveyed the visitors to the property of the Dome Mines, Ltd., where, however, only the rich surface showing of gold ore, known as the "Golden Stairway," was seen, the workings underground not having been accessible to the party. The superintendent, C. W. Meek, and several of his assistants showed the party over the 40-stamp mill, which was not so well advanced towards completion as that at the Hollinger mine. While, in some important particulars, the treatment of the ore will be similar in the two mills, in others it differs. For instance, at the Dome mill there will be double amalgamation as against single at the Hollinger, the second amalgamation taking place after the pulp leaves the tube mills.

A Day in Cobalt Camp.

The return trip was commenced at noon of Monday. Cobalt was reached in the evening, and the night was spent there. On Tuesday morning a start was made, in sleighs, to visit several mines and mills.

The first property visited was the Nipissing, where a "pour" of melted silver was witnessed by about half the party, the others having, through a misunderstanding, gone on to Kerr Lake.

Crown Reserve.—At the Crown Reserve, under the guidance of H. J. Stewart, assistant manager, some fine showings of silver were seen, on both the 100 and 200-foot levels, in the Carson and Office veins. On return to the surface it was learned that during four years of operation, to the end of 1911, the company had produced and shipped 12,512,377 ounces of silver of a gross value of $6,581,847.77, and had paid dividends aggregating $3,714,509.40, the net profits for 1911 alone having been $1,279,739.79, of which $1,061,288.40 was distributed in dividends and bonuses, this being at the rate of 60 per cent. on the company's dividend-bearing stock.

In the Annual Report for 1911 the president said, in part: "We are now producing ore of a higher grade than ever before, the actual average of our high-grade ore from the mine for 1911 having been more than 5,000 ounces. We have done more underground work during 1911 than in any previous year, and our total

expenditure shows a reduction in cost of one and three-tenths cents per ounce as compared with that of 1910." Later in the report the president observed: "Our policy for 1912 is to continue on the same careful, conservative lines which have brought us so much success, to maintain our regular monthly dividends and bonuses of 5 per cent., to provide for everything in the shape of expenses, royalties, depreciation, dividends, etc., and again make a substantial addition to our surplus; to continue to give special attention to outside properties, our idea being to gradually roll up a combination of properties, which the Crown Reserve Company will own or control, with the ultimate object of having a large, successful, and money-making company.

"We are still producing silver at the lowest production price of any mine in the world, our average for 1911 being 10.67 cents per ounce and our average over four years 10.34 cents per ounce. On account of the richness of our ore, and our policy of spreading the marketing of our product and taking advantage of the European as well as the Canadian and American markets, we are getting the very highest smelter price for our product and our dividend payments compare favourably with those of the best and richest mines in the world."

British American Power Co.—After leaving the Crown Reserve, a call was made at the power sub-station of the British American Power Co., which has its 8,000 horse-power generating plant on Matabitchouan River, 22 miles from Cobalt. The current is transmitted at a high voltage from the generating to the sub-station where it is reduced by three-phase step-down transformers for distribution. There are here two two-stage-compressors each having a capacity of 5,000 cubic feet of free air per minute, these being electrically driven by 1,000 horse-power induction motors. The compressed air is passed through water and air-blast coolers until all the moisture is condensed and removed, and the air is then sent out cold and dry through the distributing pipes.

Temiskaming.—Here the party was hospitably entertained by the manager, Mr. Norman R. Fisher, who first showed the visitors through the 40-stamp concentrating mill, then gave them an excellent luncheon, and finally took them down to the 400-foot level of the mine to examine the silver-bearing veins in place. In the office large samples of ore were shown, some being from the greatest depth yet reached in Cobalt camp, namely 575 feet. A noteworthy feature at this mine is a steel headframe, described as being the only one of the kind in the camp. Before leaving, Mr. Rickard, at the request of the president of the Institute, proposed a hearty vote of thanks to Mr. Fisher for his kindness and hospitality; this was supported by Dr. Miller and accorded most heartily.

Coniagas.—Most of the party spent an hour underground at the Coniagas mine, while a few looked through the mill. Much interest was evinced in the ore occurrences examined on several levels.

Trethewey.—At the Trethewey some time was spent in looking at a fine display of specimens of ores and concentrates, and much information was readily given by Colonel Hay, president of the company, and Mr. Charles A. O'Connell, manager. Each of the visitors was given several small specimens of silver ore as a souvenir of the visit. Then afternoon tea was served by Mrs. O'Connell in her home, and an enjoyable hour was spent in social chat before going to the railway station to resume the return journey.

The Return to Toronto.

At 7 o'clock p.m. the return journey to Toronto was resumed, and by 9 a.m. of Wednesday that city was reached. Gradually the visitors dispersed, until by midnight few were left at the place of rendezvous. Thus ended what was generally pronounced to have been one of the most enjoyable and markedly successful annual meetings the Canadian Mining Institute has yet held.

MR. HEDLEY ON MINING IN BRITISH COLUMBIA, 1911

In the course of an address, prepared by Mr. Robert R. Hedley, of Vancouver, B.C., for presentation at the annual meeting of the Canadian Mining Institute, held in Toronto on March 6th 7th and 8th, he gave the following information concerning the Consolidated Mining and Smelting Company of Canada, Limited, which has its head offices in Toronto:—

"This company has established at Trail, British Columbia, a great metallurgical industry. Beginning with a small copper-matting plant, it now has complete modern copper-matting, and lead-smelting and refining plants. It is doing a large custom ore smelting business, as well as smelting its own ores and operating as owner the following mine in British Columbia: Centre Star, Iron Mask, Le Roi, War Eagle, and others, at Rossland; Phoenix Amalgamated and No. 7 group, in Boundary district; Molly Gibson, near Nelson; Richmond-Eureka, in Slocan district; and St. Eugene and Sullivan, in East Kootenay. Also, it is exploiting, under option of purchase, the Hudson Bay group and Silver Dollar, near Salmo; and the Tiger and No. 1, in Ainsworth camp. C. P. R. interests also operate coal mines at Hosmer, B.C., and Bankhead, Alberta.

"The Consolidated Company has always had a very efficient staff in mining and metallurgy. Thus, its mines are operated to the best advantage; its St. Eugene concentrator at Moyie is lacking in nothing that conduces to successful working; and its smeltery at Trail is kept up to date if not a little ahead. This company took hold of a crude and imperfect, but effective, process for refining lead by electrolysis and perfected it in every detail, until doubtless it has today the best lead-refining plant in existence. Although a little slow in putting in the Huntington-Heberlein process for roasting and desulphurizing ores, it improved on its accessories when it did instal it, and it has been quick to recognize the advantages of the Dwight-Lloyd roasting and sintering machine, which it is striving to adapt to all its most complex conditions. It is known that the company has for some time been at work on the problem of zinc metallurgy, but I do not know how near success it has got. This is with it a most vital matter, for in addition to the by-product zinc concentrate of so many of the mills, it has in the Sullivan mine large bodies of ore the zinc content of which well-nigh puts it out of the lead-smelting class;

Abstracted by Mr. E. Jacobs from an address prepared for the C. M. I. meeting by Mr. R. R. Hedley, Vancouver, B.C.

also an immeasurably larger quantity of ore quite excluded from that class by reason of its high zinc content.

"The company is now investigating the French process for reduction of mixed zinc-lead sulphides. Mr. A. Gordon French has for some time been experimenting with a small plant at Nelson, B.C., and has proclaimed his success. Whether or not it is accepted as a commercial success, Mr. French is entitled to great credit in that with only crude facilities and the aid of but one man, he has evolved this small plant and brought it to the point of producing electrolytic spelter."

Concerning copper mining and smelting in British Columbia, Mr. Hedley wrote:—

"The large and modern plants of the Granby Consolidated Mining, Smelting, and Power Company, and the British Columbia Copper Company, both in Boundary district, have accomplished great things, both in mining and metallurgy. Each is so admirable in its achievement that it is sufficient to generalize on the chief features. Without handicaps of fuel-shortage such as occurred last year, the total cost of mining and smelting ore and converting matte into blister copper may be safely stated as having been not more than $2.50 per ton of ore. Marketing the copper costs 20 cents more. The ore generally averages about 25 pounds of copper, $1 in gold, and 19 to 20c. in silver per ton. Slag losses under present conditions rarely exceed 4 pounds of copper per ton of ore.

"The British Columbia Copper Company has two blast furnaces 360 by 48 inches and one 240 by 48 inches, while the Granby Company has eight furnaces 266 by 44 inches. The latter company has recently deepened its furnaces to give a column of 11 feet above the tuyeres, which has not only increased the capacity, but has reduced the slag loss, the flue dust, and the coke consumption. The most recent change at the Granby works is in disposal of the slag, which will be elevated by travelling belt from a central pit, into which the granulated slag will first flow.

"It is gratifying to see both these companies extending their operations in the province. The Granby, having developed to its satisfaction the Hidden Creek mine, at Goose Bay, Observatory Inlet, is now proceeding with the erection of a smelting plant, with capacity to treat 2,000 tons of ore daily. At this mine the development is sufficient to estimate as in sight various considerable blocks of ore containing good value in copper. The management, however, thinks it conservative to figure as available 6,000,000 tons of two per cent. copper ore, or if it be demonstrated that 1.65 per cent. copper ore will be profitable, to double that tonnage. The precious metal value will probably be somewhat lower than at its Boundary district mines, but I can see no reason for expecting a higher cost at Hidden Creek than in the Boundary. True, coke will at the former be, for the present, either of inferior quality, or greater cost, but the sulphur content of the ore should permit the company to use but one-quarter of the quantity.

"The British Columbia Copper Company has recently installed a cyanide plant at its Napoleon mine, situated not far south of the International Boundary line. It is now exploiting under option of purchase a large field of silicious low-grade copper ore near Princeton, Similkameen; also a big deposit of low-grade gold ore near Silverton, Slocan Lake. If proven worthy, the former will require the installation of a copper-reduction plant, and the latter a cyanide mill, at the respective properties. The establishment of a smeltery at Princeton would do much to encourage the opening of promising mineral claims in that district."

"In the way of notable development," Mr. Hedley observed further, "we have the well-earned success of the Britannia Mining and Smelting Company in finding much profitable ore after four years of mine development and plant improvement. When the price of copper dropped to the neighbourhood of twelve cents per pound it was found that the then known vast bodies of ore containing 1.75 to 2.5 per cent. copper as chalcopyrite, in a vitreous, silicious gangue, were not profitable. During 1911, however, the Britannia mined and treated more than 100,000 tons of ore containing about 5 per cent. copper, perfected its concentration process until it showed a recovery of about 80 per cent. in its mines, and developed a large tonnage of similar ore. The company is operating one unit of the Elmore Vacuum Process plant with, I am told, marked success, but I can give no authoritative details.

"The Hedley Gold Mining Company has improved its condition materially, but without any marked change of methods or plant, except the addition of a tube mill and slime tables. In 1911 this company paid dividends totalling 25 per cent. on its issued capital of $1,200,000, operating on $12 ore. I am told the tube mill capacity is insufficient, and some sand is treated that leaves the mill containing $1.25 to $1.50 per ton, while the slimes contain but 50 cents per ton. No amalgamation is now practised—simply concentration and cyanidation, recovering 93 to 94 per cent. of the value.

"I expect that within twelve months we shall point with pride to a modern gold mill, operating successfully on the well-developed ore reserves of the Mother-lode mine at Sheep Creek, Nelson mining division, and it is likely that ere many years shall have passed we shall have at least one other gold mill at Sheep Creek.

Outlook for Smelting Iron Ore.

"It is well known that there are in British Columbia large and important bodies of high-class magnetite. Those of which ther eis most knowledge are on Texada Island; Bugaboo Creek and Quinsam, on Vancouver Island; and Louise Island of the Queen Charlotte group. The first-mentioned is the most important, for the reason that its quantity is undoubtedly large, its quality (with the exception of small areas near the contact) is excellent, and its situation such that the ore can be mined and put into bunkers at deep tidewater at an extremely low cost. With crude handling facilities and hand labour for mining, it now has a record of cost of 90 cents per ton.

At Quinsam a crew of men has been kept at work for more than a year developing the ore. Mining engineers have reported quantity and quality at the two other localities mentioned, and there are many others that invite exploitation.

In the past few years there have been many announcements of the intended establishment of iron and steel manufacturing works on the coast of British Columbia, and many differences of opinion may be heard on the question of its justification and feasibility. On the first point, with a tremendous increase in the use of structural steel and reinforced concrete, to say nothing of railway construction and the general

rapid progress of the country, it would seem to me to be worth investigating at least. As to the feasibility —in the last quarter of the past century, the Union Iron Works of San Francisco made the best of pig iron, from Texada Island ores, at Irondale, Washington. Recently, the Western Steel Corporation made pig iron at the same place with improved plant, using Crow's Nest Pass coke, costing $10 per ton. This was abandoned as too expensive, and pig iron was then brought in from China at a cost of $16 per ton, which, with abundant scrap, was manufactured into a high quality of steel at a cost of $18.90 per ton and produced merchant bar at $26.90 per ton. It is claimed that with the addition to the plant of a 50-ton crane, costs can be cut approximately $2 per ton.

"Given a good quality of metallurgical coke at $5 per ton, which is not improbable in the near future, there is no reason why British Columbia pig iron should not take the place of Chinese, and a profitable industry be established on the Canadian side of the International boundary line. We have, also, the assurance that the Western Canada Power Company will make a very low price for power for such purposes.

"Again, I suggest, the question is worthy of careful consideration."

THE DOMES OF NOVA SCOTIA

By T. A. Rickard.

PART I.

General Geology.

The Province of Nova Scotia is remarkable among regions yielding gold, not for the amount of precious metal produced, but for a beautiful lode-structure, the origin of which has provoked the constructive imagination of geologists for 50 years. As this interval of time coincides with the age of modern geology, the theories offered in explanation of local conditions serve admirably to illustrate the development of a science that has only lately achieved obvious economic importance as an aid to world-wide industry.

The gold mining region in question occupies the seaward half of the peninsula of Nova Scotia and is traversed by a series of sedimentary rocks into which granite has intruded. Mining in the granite has not been profitable, all the productive activities of the past having been confined to the sedimentary series, consisting of highly altered beds of quartzite and slate of great geologic antiquity, that is, at least as old as the Cambrian, although, in the absence of trustworthy fossil remains, it is uncertain whether they may not be even pre-Cambrian, namely, Algonkian. These beds of quartzite and slate have a known thickness of 30,000 feet, divided into an upper division of dark slate, with an estimated thickness of 11,500 feet, and a lower division of slate and quartzite about 18,000 feet thick. It is in the lower series that the gold-bearing lodes are found, only one noteworthy mine having been worked in the upper slate, and even this exception occurs close to the line drawn between the two divisions.

The gold mining region has a maximum length, from east to west, of 200 miles, and a width, from north to south, varying from 8 to 50 miles, so that the total area comprised is about 3,000 square miles. (See map.) The heart of the region extends from Caribou to Moose River, the horizontal distance being 10 miles and the vertical thickness of strata 18,000 feet, in one broad monoclinal fold with minor undulations. Across this section quartzite predominates, the slate appearing in beds relatively infrequent and thin. The sand-rock from which the quartzite originated must have contained lime, for calcite is abundant. The fine silt, now changed to slate, has been much hardened, but its true character is not obscured. Of later igneous rocks there is scant evidence, save at Tangier, where dikes or diorite have been noted; but they do not appear to have influenced the distribution of the gold. We have to deal, therefore, with metamorphosed sediments of one series and the granite that has intruded into and through them.

The age of the granite is important, for it bears upon the geologic antiquity of the ore deposits. By reference to maps* it can be seen that the granite has displaced more than a third of the superficial area formerly occupied by the slate and quartzite formation; indeed, it has been suggested that the granite represents these rocks in the last phase of their metamorphism, but this is a deep question, in more senses than one, and need not concern us just now. As we see the granite to-day it is an intrusive rock, and, therefore, younger than the gold-bearing formation into which it has been thrust. How much younger? The evidence on this point is adequate: fragments of detrital granite are found in northern Nova Scotia within Middle Devonian sediments; on the other hand, in the Bear River basin the granite cuts into the Upper Silurian of the Oriskany horizon. Therefore the granite is older than the middle, and younger than the base of the Devonian; it is of early Devonian age. Between the deposition of the sediments now constituting the slate-quartzite series and the irruption of the granite, there stretches the whole of the Silurian period, and a part, if not all, of the Cambrian.

The slate-quartzite series is probably Algonkian; the granite is early Devonian; what, then, is the age of the gold-bearing quartz? The best answer to that is afforded by the fact that the quartz veins in places (as at Forest Hill) follow tongues or apophyses of granite, and gold has been detected in the granite at such places. Moreover, mineralized quartz penetrates the granite at other places (as at Country Harbour). Therefore the quartz is younger than the granite. Finally, a conglomerate known to be of Lower Carboniferous age and composed of the eroded fragments of the slate-quartzite series has been found at Gay's River, and from this conglomerate gold has been won by mining. The deposition of gold in the slate and quartzite must have commenced before the Carboniferous. Thus the gold and the granite do not differ

A paper to be discussed at a meeting of the Institution of Mining and Metallurgy, to be held at the Rooms of the Geological Society, Burlington House, Piccadilly, W., on Thursday, April 18th, 1912, at 8 o'clock p.m., and presented at a meeting of the Canadian Mining Institute at Toronto, on March 6th, 1912.

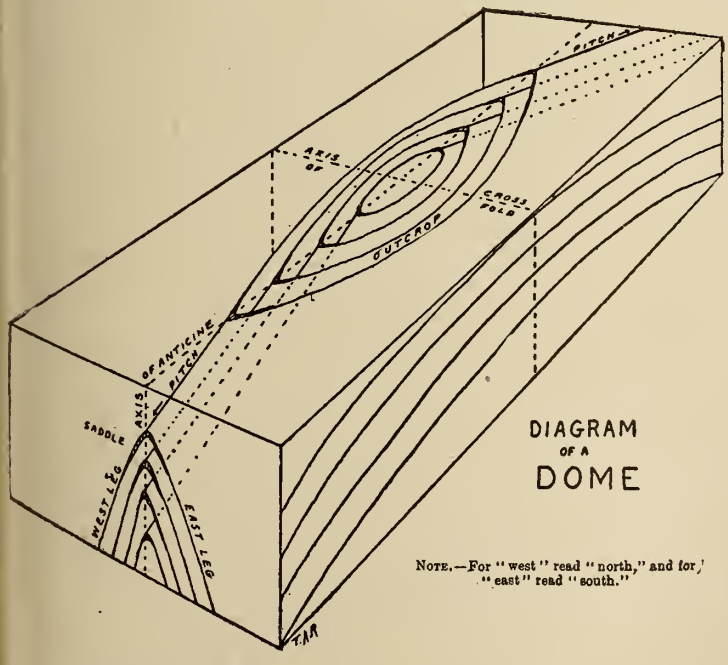
*I refer to the excellent maps prepared by E. R. Faribault for the Geological Survey of Canada.

widely as regards the time of their introduction, although the limits of one of the older geological divisions, such as the Devonian, include a period of time so vast as to beggar the imagination of a chemist in his laboratory. Nor is it to be assumed that the deposition of the gold, much less its distribution and concentration in the quartz, so as to constitute ore bodies, was confined to any single period. Once brought within reach of the agencies of solution and precipitation lurking in the waters that circulate near the earth's surface, the gold became forever subject to migration, tending to concentrate or to scatter the metal according to changing chemical and physical conditions.

The land now represented by Nova Scotia has passed through successive periods of pressure and uplift, the margin of the aboriginal American continent having been roughly parallel to the longer axis of the Province. The Algonkian beds have undergone tremendous folding. The Silurian and Devonian rocks overlying the gold-bearing series also exhibit plication, but the folds are not so conformable as to warrant the belief that one agency was responsible for all the disturbances recorded by these rocks of different geological ages. It is probable that the Algonkian sediments underwent lateral pressure throughout the Cambrian period and later, especially at the time of the granitic intrusion, for it is apparent that the basal strata from which the slate and quartzite were evolved have suffered long-continued deformation. Besides the main folds, with their axes running east and west, there are cross-folds, the net result of which has been to form domes and troughs. These constitute the characteristic geological feature of the region and largely determine the shape of the ore bodies from which gold is extracted by mining and milling.

The Domes.

The gold is associated with quartz, which in the main follows the bedding of the country-rock; hence it forms sheeted bodies of ore that are sandwiched between the stratification, especially along the thin seams of slate. Since the quartz follows the structural lines of the country-rock, it forms "saddles" where the slate and quartzite have been bent into anticlinal folds; but the most pronounced development of ore—for sometimes the quartz contains enough gold to constitute ore—is on the "domes" formed where folds cross each other.



This domical structure leads to interesting results. Owing to erosion, the crests of the domes have been degraded to the level of the present surface, on the plane of which the bedding now assumes an elliptical form. Any vein of quartz deposited along a bedding-plane will reproduce this structure. If on a flank of the dome, north or south, it will have a nearly straight strike, but in the approach to the ends, east and west, of the dome, it will curve in accord with the fundamental structure. At the "nose" or extreme end of the longer axis of a dome, the quartz will be curved to a bow. All this is on the plane of the surface. If followed underground such a quartz vein will form a saddle, by being curved with the bedding of the anticlinal fold whose axis runs east and west. Again, owing to the synclinal fold, whose axis runs north and south, the saddle will pitch or slope if exposed at the east or west end of the dome, where the strata plunge in accord with the synclinal curvature of the cross-fold. This description will be made clearer by reference to the accompanying diagram, which, in effect, exhibits the appearance of a model if made in glass. The top of the block represents the geological surface; the elliptical outcrops are evident; at the west end of the curving strata are shown the quartz veins. These in cross-section, as exposed at the left side of the block, constitute "saddles," the pitch of which is indicated.

As regards actual mining, the workings that follow the pitching saddles usually consist of a sloping shaft with curving levels. This is best exemplified by the Richardson mine, a model of which was prepared by E. P. Brown.* At Bendigo, an Australian locality, famous for this type of lode, the "saddle-reef," as it is there called, follows sharp arches in slate and sandstone, but the pitch of the anticlines is flat, because cross-folds are not emphasized; that is, the Bendigo saddle is like a steep ridge with slightly undulating crest. The Nova Scotian dome resembles the upturned bottom of a boat, the keel of which stands for the major anticlinal axis.

While referring to Bendigo as a geological analogy, a further reference may be made to the question of anticlinal pitch. In 1890 and 1891, when I was examining the Bendigo mines, the truly anticlinal structure of the "saddle-reefs" was not recognized; hence the pitch of the anticlines was not considered. As the crests of the folds at Bendigo are not marked by violent changes of slope, especially within the short extent of a single mining property, it is not surprising that this detail of the local geology was neglected. Within recent years, however, it has become generally recognized that the changes of pitch or undulations along the anticlinal axis (there called "lines of reef") constitute an important factor in modifying the distribution of gold-bearing quartz. Thus the Bendigo type of ore deposit finds closer resemblance to the Nova Scotian dome.

Only a small portion, however, of the gold contributed by Nova Scotia has been extracted from quartz at the apex of these domes. Most of it has been broken from interbedded veins associated with the legs or stumps of arched structures whose crests have

*Canadian Mining Journal, August, 1 .

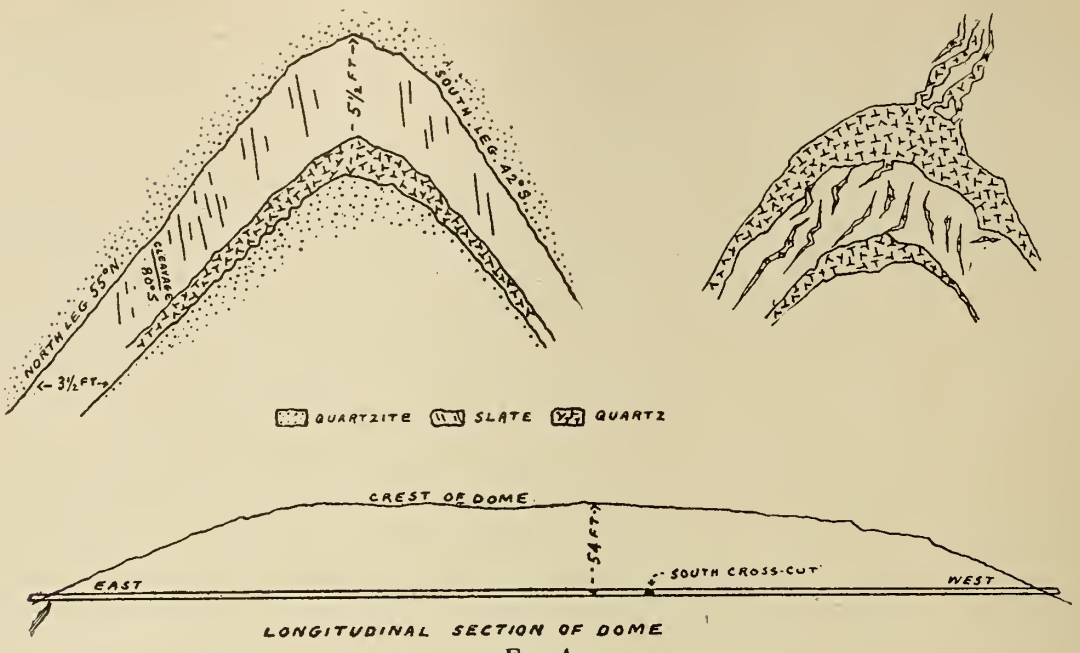


Fig. A.

vanished. It will be understood that the present surface, from which all mining starts, represents a nearly horizontal section that has been cut, by erosion, through the folds at a varying distance from their crests. The bedding-planes, and the quartz veins conforming to them, that are least curved, are simply farthest from the anticlinal crests, since all the beds of slate and quartzite are members of the folded series. The greater the distance from the anticlinal axis the less the curvature, so that many veins following the nearly straight strike and nearly vertical dip of the country appear to be unrelated to quartz deposits on the domes, although structurally they are allied. Such veins follow the lower portion of an arch, the crest of which, at a higher horizon, since denuded, overlapped the dome that survives in the centre of the fold. A distinction must be made, however; it is not necessary to assume, as some writers have done, that every quartz vein at one time extended over an arch of rock that has since been removed. That is another question. Whether the quartz was conterminous with the entire fold of the country-rock before it was reduced by erosion to the level of the present surface is a point on which I shall speak later. At present I am dealing with facts only, not theory. It is advisable to follow the scientific method of proceeding from the known to the unknown. It is not necessary to assume, and I do not believe, that the quartz vein distant from a dome, or an anticlinal arch, is a part of a much more extensive body that covered the crest of a dome eroded long ago, nor that the interbedded quartz now found several thousand feet from any anticlinal axis was contemporaneous in its origin with, however dependent in structure upon, the lines of weakness created in the rock formation during the process of folding.

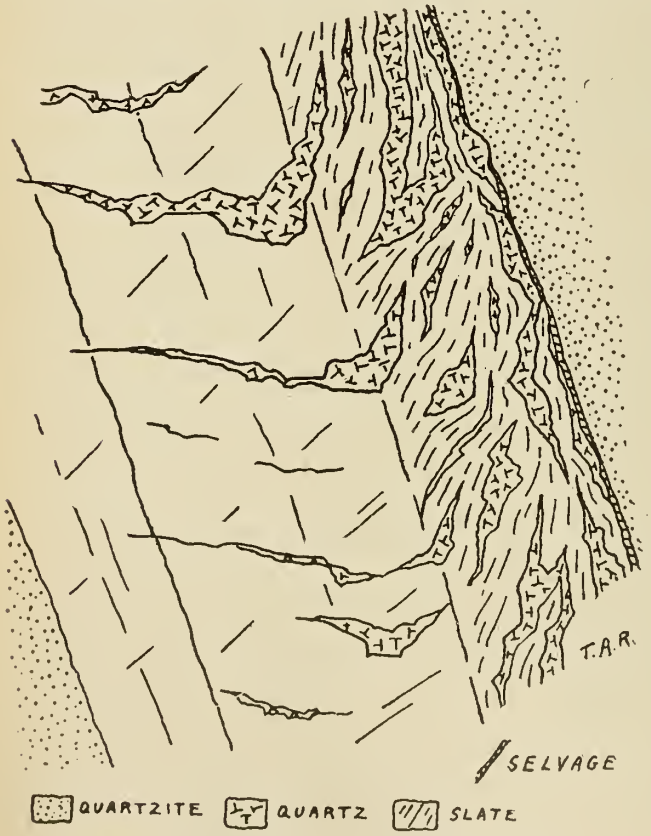


Fig. E.—The Lode at Waverley.

At the Dufferin mine, in the Salmon River district, I saw a dome whose outcrop is barely 2,000 feet long, east to west. In other districts such as Caribou, Mount Uniacke, and Oldham, it is obvious, from the geological surveys of Mr. Faribault, that domes exist having a length of 2,500, 2,000 and 3,000 feet, respectively. Quartz, in the shape of saddle-veins, has been concentrated at the cross-folds, where the nose of the dome plunges underground, but in no case, as far as I know, has it been exploited profitably at both ends of a dome. In the Dufferin the domical structure is exposed on the 300-foot level, which follows a quartz vein known as the No. 1a. Here, as shown in Fig. A, the east and west legs of the dome are 1,300 feet apart, while the north and south legs have a spread of only 200 feet at the same level. Since Mr. Faribault's map was published, it has been ascertained by him that the anticlinal fold is not a single flexure, but divided into two saddles at its crest. Of these, the southern is accom-

panied by a succession of quartz saddles, which have been exploited to a vertical depth of 300 feet and then abandoned as unprofitable. The northern minor flexure has no saddle of quartz, but its northern leg is accompanied by a band of quartz stringers that extend as cross-veins from the apex to the surface and reach in depth to the point where the bedding is turned by the syncline. Stringers of quartz cross the veins that follow the bedding, and it is suggested that the former coincide with fractures due to the cross-fold. In "centre country," that is, at the axis of a fold, even the quartzite exhibits cleavage. As regards the saddles, it is apparent (in Fig. A) that the anticlinal axis is not vertical, but dips south; hence the south leg is flatter than the north. The cleavage is at a high angle southward. The north leg has been more profitably mined than the south, because the latter is terminated abruptly by the synclinal flexure. The corrugation shown under the north leg of the larger saddle near its apex nearly conforms to the pitch of the anticline, which is 2 degrees W. at 125 feet west of the shaft. The saddle shown on the left of Fig. A is a supplementary saddle below the main formation exploited in the Dufferin mine. The quartz is from 8 to 10 inches thick at the apex, and thins going down. The right-hand sketch shows how stringers extend from the saddle across the bedding, but in the line of the anticlinal axis.

From 1881 to 1895 the Dufferin mine yielded 39,130 oz. gold from 93,701 tons, showing an average of 8 dwt. per ton.

Crenulation.

The "saddles" of Nova Scotia are also remarkable for peculiar corrugations or crumplings of quartz, to

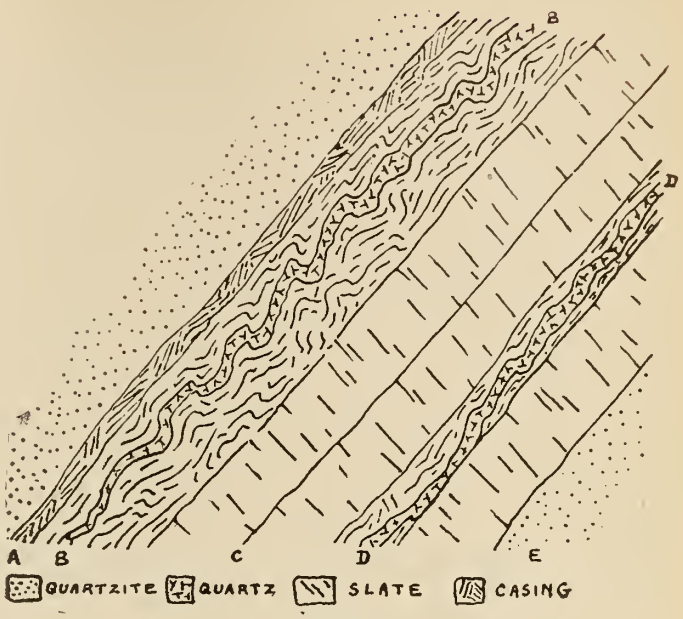


FIG. F.

which the name of "barrel formation" has been accorded, because, when such a corrugated deposit is uncovered, it looks to the miner like the back or top of barrels lying in rows. The accompanying reprints from old woodcuts, appearing in a report by Silliman, will indicate the appearance of such a lode as exposed in a large open-cut on the crest of a hill at Waverley.* I went thither in August, 1905, and saw enough to confirm the general accuracy of these

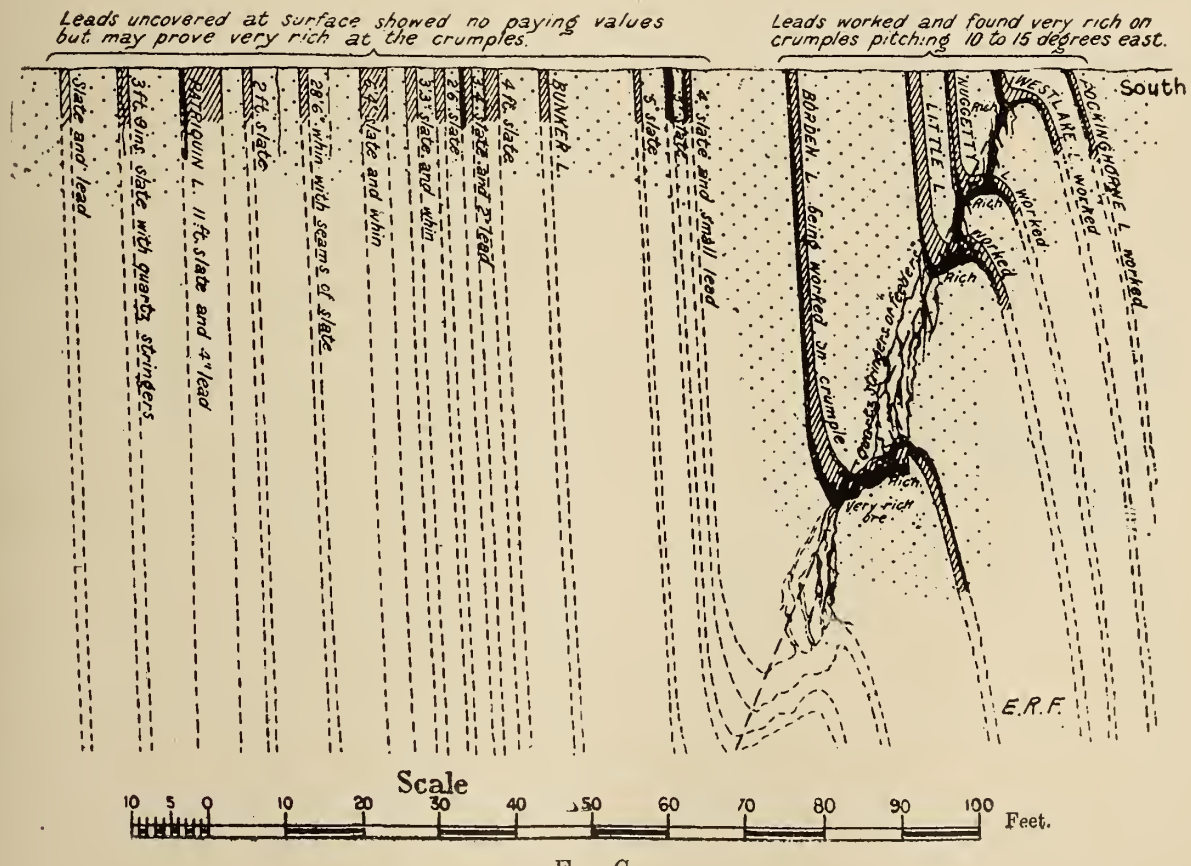

Leads uncovered at surface showed no paying values but may prove very rich at the crumples.
Leads worked and found very rich on crumples pitching 10 to 15 degrees east.
South
slate and lead
3 ft. vein slate with quartz stringers
BARRAQUIN L. 11 ft. slate and 4" lead
8 ft. slate
20 ft. slate with seams of slate
slate and white
slate and lead
4 ft. slate
RUNKER L.
slate and small lead
BURPEE L. being worked on crumple
LITTLE L.
WHISSETT
INES LAKE worked
ROCKINGHORSE L. worked
rich
worked
Very rich ore
E.R.F.
Scale
10 5 0 10 20 30 40 50 60 70 80 90 100
Feet.

FIG. G.

*It is sometimes spelled Waverly. I have adopted the spelling used by the Canadian Geological Survey.
†This term has been previously used by J. Edmund Woodman, in his paper on the "Geology of Moose River Gold District." Nova Scotian Institute of Science, 1903, vol. XI., part I., pp. 18-88.

angles to the strike; "pitch" is measured along the sketches. The corrugation, crinkling, or crumpling, as it has been variously termed, was most remarkable. As a technical term descriptive of this structure, I suggest "crenation," from crena, a furrow or notch, for the larger barrel structure, and "crenulation,"† from crenula, the diminutive of crena, for the smaller apparently serpentine threads of quartz.

While adopting the Latin derivative for the barrel structure, I deem it best to use the English word, "furrow," for the individual markings that constitute the appearance termed "crenulation." For the larger manifestation of the same structure it might, from an academic point of view, be desirable to use "crenation," but this is not necessary to a clear description, and may, therefore, be set aside for the present. "Furrow" and "crenulation" apply to the markings in the wall-rock, and not to the quartz filling them. The quartz is found in veins of varying continuity, and in shape reproducing the structure of the encasing rock. Hence it appears crinkled, corrugated, crumpled, or serpentine, according to the degree to which the angles are curved. When enlarged, the bends make the so-called "barrels"; when infrequent or individual, and especially when persistent, the "barrel" becomes known as a "roll." Though varying in size and multiplicity, these forms of gold-bearing quartz are the product of similar structural relations.

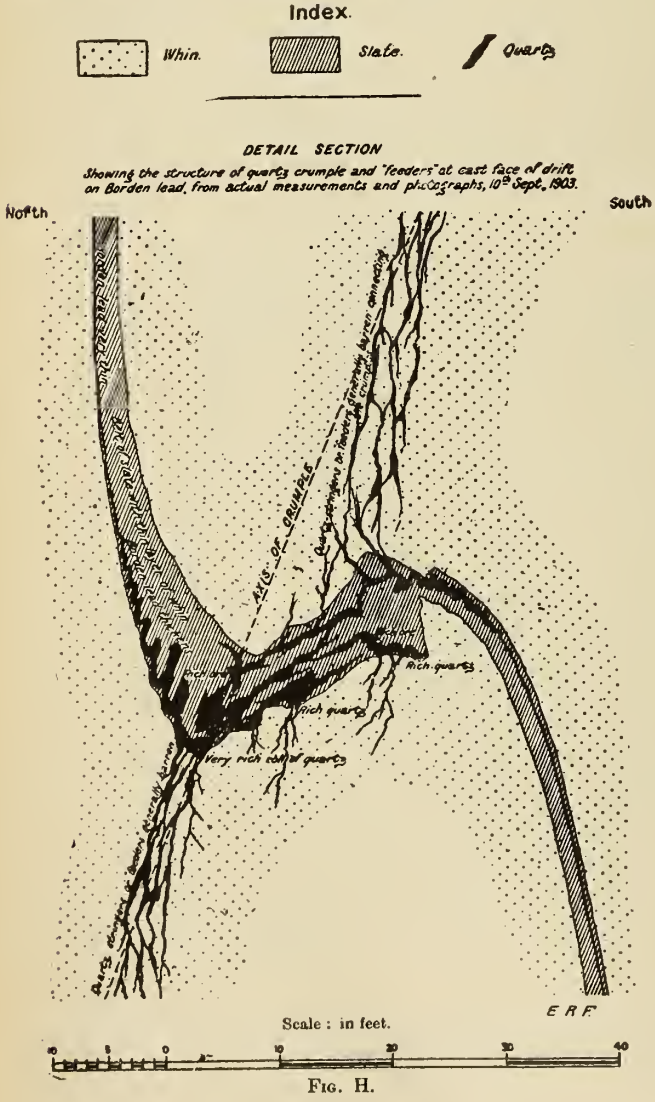


Fig. H.

The famous ore deposit of Waverley lies at the crest of a low hill, and at the western end of it, where an anticline is crossed by a syncline, so as to cause the folded strata to pitch steeper than the gentle hillslope. The following description is transcribed from my notes made on August 18, 1905. On the crest of the hill the apex of the pitching saddle is uncovered by shallow diggings; the quartz has been removed, but Silliman's sketch indicates how it looked when stripped. In the old excavations, which followed the north and south legs for a few feet, the crenulation on the hanging-wall quartzite can be seen. The furrows are nearly horizontal, or at right angles to the dip of the wall-rock. On descending the incline-shaft of the mine to the third level, the crenulation is found pitching at a strong angle with the dip of the stratification, becoming steeper in the approach to the main anticlinal axis. On this level the slate of the foot-wall shows where the crenulated quartz formerly lay, leaving casts like those left in river mud by logs, of irregular length and width, placed alongside. It is not an undulation; it is a furrow. The quartz remaining averages 8 inches thick, with a maximum width of 12 to 15 inches. The vein crosses from the foot to the hanging-wall of the slate bed within a distance of 20 to 25 feet. The slate is not faulted. Numerous joints cross the fluting and cause it to resemble bamboo. The cleavage and the bedding intersect along the line of the crenulation. On the south side of the anticline the furrows plunge eastward, until on reaching the anticlinal axis (near the Pig shaft) they are parallel to it; here, therefore, they are identified with the dip and at right angles to the strike of the vein and its enclosing wall-rock. As the vein curves at the nose of the dome and is followed around the corner, so to speak, the crenulation begins to exhibit a deviation from the dip until it is again pitching at a decided angle. At a point 125 feet eastward from the Pig shaft the quartz has diminished to a seam only 2 or 3 inches thick; concurrently the slate has dwindled from a bed 7 or 8 feet thick (at the apex) to a few inches, and the crenulation has faded away. When last visible it was nearly horizontal, that is, at right angles to the dip of the wall-rock. On the intermediate level the cleavage is seen to be opposed to the bedding. There is a suggestion of radiated fracturing or fissility. The accompanying sketch (Fig. E) shows the lode on the No. 1 level looking west at the north leg. Thus at Waverley the crenulations or barrels pitch with the anticline at the axis and flatten as distance is gained along the flanks of the dome. At 400 feet from the axis the furrows lie at an angle of 8 degrees from the horizontal, and shortly before becoming horizontal they disappear.

The total yield of the Waverley district (up to the cessation of work in 1898) is 61,308 oz. gold from 122,346 tons of ore, this being an average of 9½ dwt. per ton.

As a persistent advocate of the precise use of technical terms in descriptive writing, I cannot refrain from remarking on the fact that the maps of the Geological Survey employ the word "dip" to indicate the angle of the rolls and of the crenulation, when reference is obviously meant to the "pitch." The "dip" of the slate is given, say, as 52 degrees W., and then the "dip" of the crenulation is given as 15 degrees N., when, of course, the crenulation is on the plane of the slate bed, and therefore dipping the same, but pitching north at a strong angle. "Dip" is measured at right

strike. Again, the use of "whin," to signify quartzite, is bewildering to anyone who is not familiar with the local Nova Scotian usage; for "whin" has heretofore been applied, also locally, in Derbyshire, to an igneous rock. Hardly less objectionable is the local term "belt" for slate, because this is commonly used in another sense in geology. Thus, one author speaks of a "belt" of angulars; one might infer that it was a bed of slate full of cross-veins; and when it is written that "the belt follows the stratification," one concludes—at least I concluded for a moment—that a geologic truism was

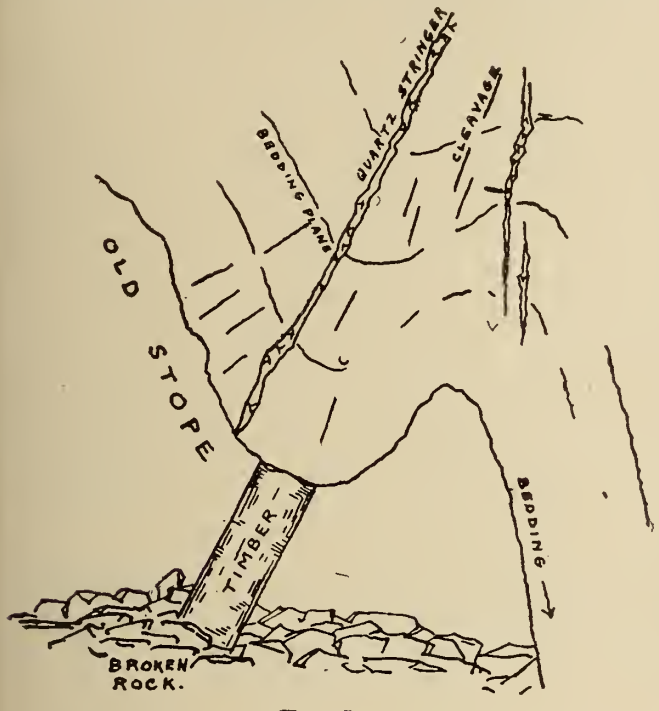


FIG. I.

being stated. Another objectionable localism is "pay-streak" to signify ore-shoot; in mining a "streak" is a thin prolongation of ore, a thread-like or ribbony structure, but in Nova Scotia it refers to an ore body having a definite pitch. While clumsy and unnecessary when employed locally, such terms are undoubtedly confusing when used in writings intended to be read by persons at a distance.

At Oldham more evidence was gathered. Here the mining was at the eastern end of a dome. In an excavation at the side of the road I made the sketch shown in Fig. F. The bedding dips 45 degrees S.; the cleavage is 62 degrees N. The line of intersection pitches clearly at 12 degrees E. The crenulation pitches similarly. In approaching the nose of the dome, or the place where the anticline is crossed by a syncline, it is apparent that the furrows and the quartz associated with them pitch eastward at an increasing angle.

Oldham is celebrated for its "rolls." These I regard as isolated or infrequent furrows of larger amplitude. Thus a "roll' in a quartz vein, following the bedding-plane, represents a persistent enlargement and enrichment along a bend in the foot-wall. A roll is sometimes found where a cross-vein or "angular" meets a vein that follows the bedding. This would appear to mark a displacement at the intersection, just as the normal roll represents a slip where the cleavage crosses the bedding. Angulars are most plentiful at the place of cross-folding, that is, where intensity of movement has induced maximum fracturing.

Oldham has been able to boast some small rich mines. Most of them have yielded gold from recognized rolls, to which the names of their discoverers still cling. One of the most famous is the Hardman roll, named after that veteran engineer, John E. Hardman. This roll is on the Dunbrack vein, which dips 38 degrees S. near the surface and increases (at a depth of 300 feet vertically) to 46 degrees. Two rolls, parallel to each other, have been found. The first, or Ned's roll, carried 6 to 8 inches of quartz in an ellipsoidal body 10 to 15 feet long. The second, or Hardman roll, carried 10 to 15 inches of quartz, increasing rarely to 18 in., and for a length of 18 feet, narrowing at one place to 8 feet, but fairly uniform in size. Both rolls are accompanied by minor fluting of the foot-wall. In going eastward this crenulation, with the rolls, pitches more steeply. Between the rolls the wall-rock exhibits sharp fluting and is accompanied by 4 to 5 inches of quartz. The first roll was struck in the No. 2 shaft at 160 feet and the second at 300 feet on the dip. The No. 1 shaft cut the first at 300 feet and the second at 450 feet on the dip. It appears, therefore, that they maintained an approximate parallelism. Eastward these rolls are cut off by a well-defined fault; they have not been exploited beyond it, although the geological map indicates the position of the vein east of the fault. It is stated that the top roll marks the junction with an angular. These are notes obtained from Messrs. Faribault and Weatherbe, with data given by resident miners. The workings are no longer accessible.

On writing to Mr. Hardman, in Nov., 1905, he stated to me that the rolls are "simply enlargements of the quartz vein-filling, horizontal sections of which have the form of elongated ellipses." The quartz of the Dunbrack vein, he added, had a general assay-value of $3 to $15 (or 3 to 15 dwt.) per ton in free gold, whereas the ore of the roll itself never yielded less than $25, and sometimes as high as $1,600 per ton "for lots of 8 to 10 tons." The high-grade ore was associated with galena and zinc-blende, the poorer quartz carrying from 1½ to 2½ per cent. mispickel, iron pyrite, and pyrrhotite, all of these minerals being found also in the rich ore, but subordinate to the galena and blende. Mr. Hardman says:

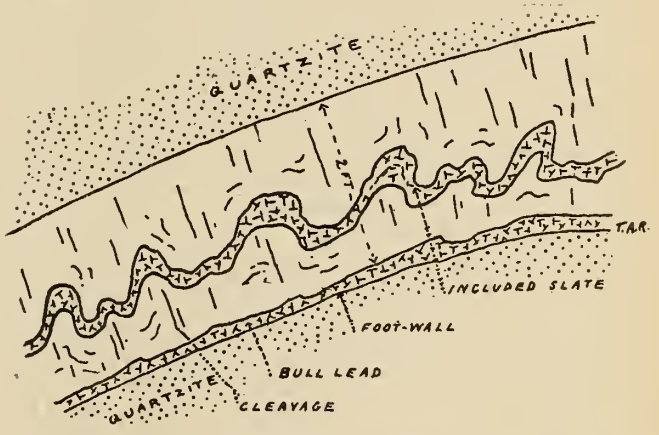


FIG. J.

"The thickness of the Dunbrack vein as a whole (throughout its worked extent of over 2,000 feet) would range from 4 to 5 in.; in places it narrows down to an inch or less, in other places it widens out to about 9 in., but the average width, apart from the rolls, I should put at about 5 in. In the rolls this width is much increased, the average width of the quartz in a

roll being about 17 to 18 inches. The extremes within the roll would run from 8 to 22 inches. Occasionally there came into the vein what are called 'angulars,' which you will recognize under the more general name of 'feeders.' These are small quartz-veins, of very limited length, and comparatively limited width (ranging from ½ in. to 1½ in.); often they are pure quartz, but also often they contain quite an amount of carbonate of iron or siderite. These angulars, when coming into the vein from the quartzite hanging wall had little or no effect on the richness of the ore, but when they came in from the foot-wall side, also through the quartzite, they were decided feeders or enlargers of the quartz above them."

At mount Uniacke, on August 21, 1905, I saw a "crumple" or subordinate fold in the Borden vein. This was described by Mr. Faribault in the summary report of the Canadian Geological Survey for 1903, and is there accompanied by a beautiful explanatory drawing. The evidence obtained in the course of mining indicates that the subordinate fold is echoed by a series of strata, and that the quartz veins following the fold are connected by stringers along the anticlinal axis. The workings visited by me showed that the fold had an amplitude or cross-sectional measurement of 40 feet, and a height or vertical measurement of 15 feet. It had been followed for 340 feet on the pitch, which sloped eastward at 15 degrees. This small fold showed a double crumple in the roof or hanging wall and a single bend in the foot-wall, the divergence into the two clumples being accentuated eastward. Here we have, on a small scale, a maximum of contortion in the bedding, creating highly favourable conditions for the passage of mineral solutions. This locality is 650 feet south of the main anticlinal axis, and at the westward end of a dome.

Fig. G. is a general cross-section, showing the relation of a series of parallel veins, and the subordinate fold as exposed in four successive "leads" or veins. Fig. H is a detailed section on the Borden vein. It will be noted that he marks the cleavage in the slate as being at a high angle northward. Fig. I is a sketch made by me in an old stope. A quartz stringer along the anticlinal axis indicates the system of feeders connecting the successive crumples. The crenulation accompanying the quartz, previously removed by mining, is seen in an adjoining shaft, where it slopes west slightly; in an open-cut farther west the "fluting" or crenulation pitches 4 degrees to 5 degrees eastward owing to a local bend in the strike of the stratification. The crumpling or subordinate fold, of course, will not be confused with the crenulation; one is a local plication of the bedding-planes, while the other is a fluting along the surface of the beds. On the bottom level of the mine the cleavage is distinguishable in the quartzitic rock of the foot-wall, and it is seen that the line of intersection with the bedding pitches 15 degrees to 20 degrees west, while the incipient crumpling on the same wall-rock pitches 10 degrees to 15 degrees east. Fig. J is a sketch taken in a stope on the south leg of the crumple and 150 feet east of the shaft. The crenulated quartz vein is nearly in the centre of a bed of slate (2 feet thick), but it does not follow the bedding. The cleavage is almost at right angles to the walls of the slate bed, the foot-wall of which is followed by a vein of "bull" quartz, namely, barren white quartz as distinguished from the bluish-grey mineralized quartz of the crenulated vein. The latter shows occasional banding, due to included slate. This is a good example of the "barrel" quartz of Nova Scotia.

(To be continued.)

THE HOLLINGER MILL

(From the First Annual Report of the Hollinger Gold Mines, Limited.)

The initial mill will have a crushing capacity of 300 tons per day, while the cyanide plant will be capable of treating 500 tons per day. The extra capacity of the cyanide plant has been provided at the outset in order to avoid the complications and heavy costs of making additions later on, the installation of additional stamps being a comparatively simple matter.

Our original plan had been to crush and amalgamate and to concentrate the sulphides for future treatment, in a more or less incomplete mill, meanwhile conducting experiments to determine the most suitable methods of completing the process, Mr. A. G. Kirby, of Cobalt, having being retained as consulting metallurgical engineer.

The fire of May 19th destroyed the thirty-stamp mill then under construction, and the impassible condition of the roads, coupled with the effects of the fire which swept the district on July 11th, resulted in a complete set-back to our work and necessitated a change in plans.

Owing to the loss in time engendered by the above causes, the proposed experimental work had of necessity to be curtailed, and some type of a permanent mill had to be decided upon, in order to take advantage of the remaining months of summer suitable for preparing the mill site.

Accordingly a sample of ore was taken from the dumps and shipped to Mr. Kirby at Cobalt for experimental treatment. A summary of the test results is as follows:

Tests for extraction were run upon a sample which was crushed to pass 20 mesh. This sample was found to contain 4.86 per cent. of concentrates, and these concentrates contained 82.6 per cent. of the gold contents of the ore. Following concentration the residue was leached with cyanide solutions and after 114 hours of treatment it was found that cyaniding had extracted approximately 60 per cent. of the remaining values.

A screen test made upon the residue from cyanide treatment showed that 61 per cent. of the unrecovered values lay in the sand coarser than 60 mesh.

The combined recovery, as outlined above, amounted to 92.9 per cent of the values contained in the original sample, and as the original value amounted to 2.1 ounces of gold per ton it was evident that the loss was excessive; approximately $3.00 per ton.

Tests were then made to determine the extraction after fine grinding. In these tests the ore was first ground in a tube mill to pass 120 mesh, and then split into two lots.

The first lot was concentrated, the concentrates removed and the impoverished residue agitated by air in cyanide solution. After 34½ hours of treatment the extraction by cyaniding of values contained in residues was found to be 95.1 per cent. and the combined extraction by concentration and cyaniding was 99.56 per cent. of the total original gold contents of the sample.

The second lot of the ore was concentrated, but after pan-amalgamation of the concentrates they were returned to the agitator to be treated with the tailings from the concentrator.

The combined extraction by this method was practically 100 per cent., as the residue after 36 hours of cyanide treatment carried but a trace of gold. In these tests the concentrates amounted to approximately 3.7 per cent. of the total ore treated, and the consumption of cyanide was in the neighbourhood of 2 pounds per ton.

The actual tests were more elaborate than would seem to be shown by the above outline, it being my purpose to merely indicate the steps which were taken to enable us to decide upon a method of treatment.

The net result of the tests was to show the necessity for fine grinding and also the advisability of extracting the concentrates for separate treatment.

The process as decided upon is:

Coarse grinding.
Stamping in cyanide solution.
Tube milling.
Concentration followed by amalgamation of concentrates.
Cyanide treatment of both gangue and concentrate residues.

The apparatus being installed consists of:

One gyratory crusher.
One jaw crusher.
Sampling plant.
Forty 1,500-pound stamps.
Four Dorr classifiers.
Four five-foot diameter by twenty feet long tube mills.
Spitzkasten.
Forty Deister slimes tables.
Four Dorr pulp thickeners.
Forty Trent agitators.
Two Moore filters.
Two Merrill clarifying presses.
Two Merrill precipitation presses, and the usual pumps, amalgamating pans, settlers, etc.

The mill will be electrically driven throughout.

It might be argued that the process as decided upon is too elaborate for the lower grades of the ores which will have to be treated, but it must be borne in mind that most of the ore available for immediate treatment is high in value, and in order to insure a satisfactory recovery of values it has seemed advisable to provide means for overcoming any obstacles which may arise, although up to the present no deleterious minerals have been found in the ore.

When development work is more advanced and we have a more intimate knowledge of the low-grade ores, it is possible that part of the ore can be leached coarse, without the necessity of grinding fine and filtering, but this is a question which will have to be settled by experience.

The mill being constructed will probably cost about $275,000, and it is hoped that everything will be in running order some time in April.

Mill Site.

The selection of the site for the mill has been governed by several factors. It seemed desirable that, if possible, the mill should be located upon Hollinger ground, and after experiencing the fires of May 19th and July 11th it was evident that protection against bush fires was a necessity.

The site chosen is protected upon the west by Miller Lake, upon the north by Gillies Lake, upon the east by Pearl Lake and upon the south by approximately one-half mile of cleared ground. We propose to cultivate the clear ground in the spring as a further protection against fire.

The site is about central in regard to the Hollinger, Miller-Middleton and Dixon ore bodies.

No practical site was available for a "gravity" mill, as the country is too flat to satisfy the requirements of such a mill, and in the mill under construction the pulp will be lifted by means of pumps from the concentrator floor to the cyanide plant.

DESCRIPTION OF EXPLOSION TEST AT THE EXPERIMENTAL MINE OF THE UNITED STATES BUREAU OF MINES, FEBRUARY 24, 1912

BY GEORGE S. RICE
Chief Mining Engineer.

(Printed by permission of the Director, United States Bureau of Mines.)

On the morning of the 24th of February, 1912, there was conducted at the Experimental Mine, near Bruceton, Pa., the 14th and last of the first series of such explosion tests.

The mine consists of a pair of entries in the Pittsburg seam, about 750 feet long from the outcrop opening to the face. These entries are connected by three cross-cuts; in the first of these, from the mine mouth, is a reinforced concrete stopping, the behaviour of which in the explosion was one of the points of interest, since the stopping was built of a known strength, 100 to 150 pounds to the square inch. The second cross-cut had a

15-foot sand-bag stopping supported by a timber frame. The third cross-cut was allowed to remain open so that the ventilating currents could pass through it. The fan was located at the end of an external 120-foot steel gallery leading into a passageway lined with reinforced concrete, which, in turn, entered the air course of the pair of entries above described. The fan at the time of the explosion acted as a blowing-fan, the air entering the air course passing into the last cross-cut, then into the main entry, thence returning on the main entry to the outside. The outer 200 feet of this entry was lined with reinforced concrete. For recording pressures, the velocity of the pressure wave, and the velocity of the flame wave, instruments were placed at stations 100 feet apart. The wiring connecting the stations is intricate, there being some 34 separate wires in the cable which leads from the face of the mine through the different stations to the outside, and thence to the bomb-proof observatory where some of the recording instruments are placed, and which is also the control station.

The entries or passageways are about 7 feet high and 8 to 9 feet wide, which are the usual dimensions in mines in the Pittsburg bed.

While many kinds of tests will be carried on in the Experimental Mine, the principal object at the present time is to determine how and why coal dust explodes, in order that means for prevention and limitation may be suggested from the experiments, and be tried out subsequently. It is for the purpose of understanding the nature of coal-dust explosions and for the comparison of different remedies that the instruments were provided, as without the instruments it would not be known whether the checking or prevention of the dust explosion was a matter of accident or otherwise. In order to obtain consistent results, the coal dust employed in the tests must be of known kind and size, and be distributed evenly. To accomplish such distribution, shelving three inches wide is placed along the walls and the coal dust is placed on these. In the test of February 24, one pound per linear foot of entry was used on the shelving, and one pound per linear foot was placed on the floor of the entry. In the previous public demonstration and explosion on October 31, 1911, one pound per linear foot had been used on shelves, but none on the floor. In other words, in the explosion of February 24, double the quantity was used.

The real consideration in loading is the amount per cubic foot of space, since a limiting influence in any explosion is the quantity of oxygen available for the combustion. If the coal dust is completely burned, only 12-100ths of an ounce is required to use up all the oxygen in a cubic foot of air. As a matter of fact, there is rarely complete combustion; usually there is a considerable amount of fixed carbon not consumed. The gases distilled from the coal are thus chiefly brought into play. When the loading is two pounds per linear foot there is about 64-100ths of an ounce of dust per cubic foot of air, or five times that which is theoretically necessary to use up all of the oxygen.

The coal dust loading in the main entry reached from the mouth to the face. The loading was also continued through the last cross-cut into the air course and out same for 200 feet. At this point there was placed a Taffanel stone dust barrier, which consists of a group of shelves, in this case 13, placed across the passageway about five feet above the track, these shelves being placed about 5 feet apart from centre to centre. Each shelf consisted of 2 1-inch boards, 10 inches wide, making the total width of a shelf 20 inches, on which finely ground stone dust was placed. In this case there was about 2½ cubic feet, or about 200 pounds, of stone dust on each shelf. This style of barrier has been particularly developed by M. Taffanel at the Lievin, France, testing station, where, in an external gallery, it has proven very effectual in arresting coal-dust explosions, and the system has been generally adopted in French coal mines.

Beyond the barrier of coal dust there were 50 feet more of coal-dust loading. Small tufts of loose gun cotton (loose gun-cotton is inflammable, but not explosive), were placed at intervals throughout the mine to determine the extent of the flame, in addition to the flame circuit breakers in the main entry.

The initiation of the explosion was at the face of the main entry, by a single blown-out shot of three pounds of black powder stemmed with 5 inches of fire-clay. In order to insure that the shot would blow out, the hole was cased with 1½-inch pipe. A similar hole was prepared in case of failure of the first, but was not fired. The shot was ignited by an electric detonator connected through the cable with the observatory. The wires of the flame circuit breaker were placed immediately in front of the hole so as to obtain results the moment the flame started from the cannon.

Explosion, and the Results.

After the party of mine inspectors and others interested in mining had inspected the mine, Mining Engineer L. M. Jones and Mine Foreman Howarth connected up the fire lines, no one else being in the mine. Then, having spread some coal dust in front of the holes, they came out of the mine. A locked switch at the outside was cut at the fire lines; from the observatory a generator was thrown in and a similar locked switch in the observatory. All was then ready for pressing the button. The visitors having assembled at vantage points where they would be safe, the boiler plant whistle was blown and three minutes afterward the button was pressed. Two and a half seconds later, as shown by the records, a black cloud of dust shot out of the main entrance accompanied by a tongue of flame and a violent detonation occurred. The smoke from the entrance increased in volume for a few seconds and then a reverse current, caused by a vacuum in the mine, set in and the smoke did not again come out for a number of minutes after the ventilation had been re-established by hanging brattices across the air course and over the conduit. The flame did not come out of the air course, and a later investigation of the tufts of gun-cotton showed that it had not come closer than 60 to 75 feet to the mouth. It seems probable that this effect of the non-appearance of the flame at the mouth of the air course or any extreme violence was due in part at least to the Taffanel stone dust barrier. This was found to be smashed to pieces, as would be expected in opposing so violent an explosion, but this effect is what was desired, as it threw into the explosive wave a large mass of finely divided dust which would be expected to cool the flame. From the point where the explosion originated in the face of the main entry through the cross-cut and through the barrier was a distance of 340 ft., and the explosive force was sufficient to throw down the upper 2 ft. of the sand-bag stopping. The flame evidently penetrated through the barrier. In spite of the considerable violence shown at the Taffanel barrier, there was practically no violence shown beyond it. On the whole, the conclusion is that the test was very favourable to the barrier. It may be well to state here that some previous tests have been made in which the barrier was located closer to the origin of the explosion and in these cases the flame was always extinguished while passing through the barrier.

The Effects of the Explosion in the Main Entry.

The shot which caused the ignition had blown out a small crater in the coal in spite of the pipe linings which had been broken open; except within a few feet of the shot there was little violence for a considerable distance, but there was much evidence of flame in the last cross-cut. At the second cross-cut in which there was the second sand-bag stopping, the upper two feet was thrown down, the first part of the bags towards the air course, and the upper part toward the main entry. Probably the first effect was from the explosion in the main entry and the second effect was due to the explosive wave in the air course, which, with the added length of the last cross-cut, had a longer distance to travel. Going out by the middle cross-cut, the shelving made of 3 x 4 hard-wood timber, in many places was displaced and in places broken. The track ballast in places was lifted, affected evidently by the depressed wave, or vacuum, following the explosive's wave. The violence increased in going out in the neighbourhood of station 150, the concrete arches having been lifted in several places, breaking the face of the concrete and exposing the arched iron reinforcement (¾ths-in. sq. rods). At this station the monometer indicated a pressure of over 150 lbs. per sq. in.; this pressure being measured at right angles to the explosive waves and would therefore be considered static pressure. The pressure at the station fifty feet from the mouth was less than that at station 150. Outside the mine the gates were recessed behind concrete buttresses, and these were carried bodily away. Fifty feet outside the entrance there had been an empty car. This was thrown to the opposite side of the ravine, a distance of 200 feet.

The pressure circuit breakers and the flame circuit breakers indicated that the explosion travelled quite slowly at first, but rapidly increased in velocity going outward, showing a speed of over 2,083 ft. per second obtained between stations 450 and 350, and also between stations 350 and 250. Beyond this the circuit breakers failed to work. An interesting fact in connection with the recording of the velocities of the pressure wave and the flame was that the flame, while much behind the pressure wave at the start, caught up rapidly with it as the entrance was reached.

Conclusions.

As a demonstration the experiment was less spectacular than that of October 31, 1911, as on that occasion the flames burst from all the openings; whereas in the experiment of February 24, the flame appeared only at the main entrance. However, it did not spread so widely as in the previous demonstration. There was a quick flash projected through the centre of the cloud of dust. In the explosion of October 31, 1911, the manometers did not have springs strong enough to indicate the pressures, which difficulty had been removed on February 24, so that a pressure of over 150 pounds was shown by the manometer at station 150. The records of the maximum pressure gauges placed at various stations along the entrance had not been determined. The detailed information obtained from the various readings will appear in a publication of the bureau on the work of the Experimental Mine.

As regards the efficiency of the Taffanel barrier the evidence is inconclusive. The flame was not immediately extinguished by the barrier, but about 200 feet further on; nevertheless, without the barrier, it is probable that, the large amount of dust being carried from the loading farther in, the flame would have gone to the entrance. This is the more probable since the violence shown by the smashing of the barrier indicates that the explosion had attained considerable violence at this stage. It is intended to make systematic tests of such barriers by the next series of tests.

THE McINTYRE MINE AND MILL, PORCUPINE

(Written for The Canadian Mining Journal
by S. N. Graham.*)

On March 1st the stamp mill of the McIntyre-Porcupine Mines, Limited, was started. This is the first plant to start regular milling operations since the fire last July, and as such deserves comment. Work on this mill had been quietly but energetically pushed and its early working was a surprise to many.

McIntyre Mine, No. 4 Shaft

The treatment is amalgamation followed by concentration and as the metallurgical problem seems to be not difficult the flow sheet of the mill is very simple. However, the ores of a new district always require study and often changes of the first system of treatment proposed, and the information gained in the working of this mill can be used to advantage in the larger plant which is planned for the future.

From the two 200-ton ore bins at the shaft the ore is trammed to a Blake crusher, 10 inches by 20 inches, which gives a product passing through a 2-inch ring. It is then elevated by a bucket conveyor to the mill ore bins having a capacity of 60 tons. From here it is fed by suspended feeders to ten 1,250-lb. stamps by Chalmers & Williams. The ore is crushed through 20-mesh 24-gauge wire screens, the stamps dropping 6 inches and 104 times a minute. Amalgamating is done on plates, three 48 x 60 inch plates to each five stamps. The plates are set at a slope of 1¾ inches

*Mining Engineer, Toronto, Ont.

McIntyre Mill, Power Plant and No. 1 Shaft

to a foot with a drop of one inch between plates. Below the plates are amalgam traps of the Homestake pattern. The pulp is then classified in hydraulic classifiers, the sands being concentrated on two No. 2 Deister tables and the slimes through three Callow cones on three No. 3 Deister slime tables.

The ore proves to be very free milling, the extraction on the plates being about 75 per cent., so far as can be figured from the data now on hand. The concentration is about 40 to 1, and the concentrates are very clean and free from sand. I am informed that the tailings run very low in value.

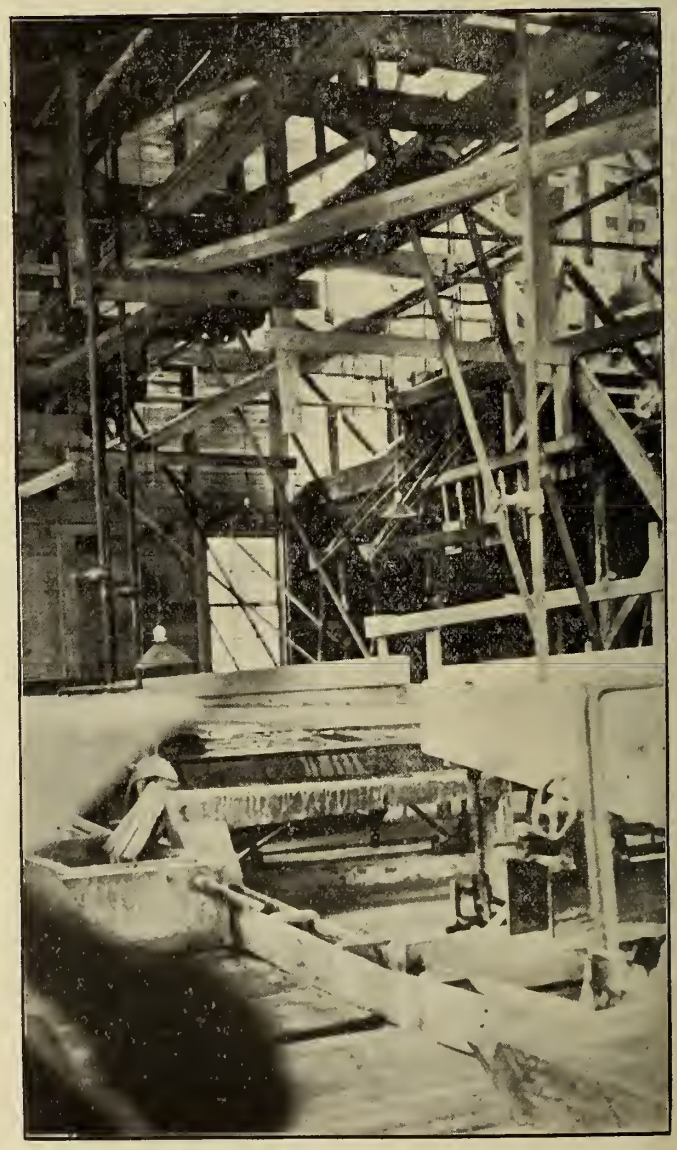
It is expected that the capacity of the plant will be 50 tons per 24 hours. Power is supplied from the Sandy Falls plant of the Porcupine Power Co. The mill is supplied with a 50 H.-P. motor for crusher and stamps and a 5 H.-P. for the tables.

Mining work is at present confined to the McIntyre claim on Pearl Lake and the area under Pearl Lake owned by the company. This are is in the zone of quartz porphyry schist running north-east from the Hollinger, through the Dixon and McIntyre claims and under and surrounding Pearl Lake, continuing past the Jupiter on the north-east end of the lake. The ore is composed of quartz and mineralized schist included in the quartz veins. In places the schist of the walls carries milling values.

In the ground north of Pearl Lake three veins are known, and which are developed by two prospecting shafts on the vein. Situated between these two is shaft No. 5, a vertical working shaft 200 feet deep. At present a new head frame is being erected here.

Shaft No. 1 is about 1,000 feet south of No. 5 and on the opposite side of the lake. This is at present the principal extraction shaft and about it are grouped the office, assay office, blacksmith shop, power plant and mill buildings. It is a vertical two compartment shaft 200 feet deep. From this shaft two veins are under development on both the 100-foot and 200-foot levels with cross-cuts to north and south from the lower level. The 200-foot level is connected with the surface by a raise and stopes are being opened up.

About 800 feet east of No. 1 shaft is No. 4, also vertical and 200 feet deep. From it development work is being done on two veins. The boarding house is situated near this shaft.



McIntyre Mill, Interior View of Gables and Classifiers

It is proposed to deepen shafts Nos. 1, 4, and 5 to the 500-foot level. From shafts Nos. 1 and 5 cross-cuts are now being driven from the 200-foot level, cross-cutting the schist underlying the lake. Here it is hoped to cut the many veins known to exist in the Dixon ground and striking into the south-west end of the lake. On the north-east end of the lake are found veins striking under the lake from the Jupiter and Plenaurum ground.

As mentioned previously, power is supplied from the Sandy Falls plant, but the mine power house is equipped with an auxiliary steam plant, consisting of two 50 H.-P. and two 60 H.-P. boilers. The 12-drill Rand compressor installed can be operated by either steam or electric power.

Mr. F. P. Swindler is manager and Mr. W. D. Cooper is mine superintendent. The mill was designed by Mr. A. G. Kirby and constructed and operated by the superintendent, Mr. R. J. Ennis.

CANADIAN MINING INSTITUTE—*WESTERN BRANCH*

(Continued from last issue.)

Brief Session of Members Only.

Early in the afternoon a brief session of members only was held for the transaction of business.

The minutes of the last general meeting of the branch, held at New Denver, Slocan Lake, were read and approved.

Included in the correspondence was a letter from the Compressed Gas Company, Limited, stating that it is including in its operations generating and compressing oxygen for mine-rescue purposes, which should be of assistance to mines in this territory, since this company has the only generating plant on the Pacific coast erected and equipped for that purpose. An offer was made to supply, free of charge, any oxygen that should be required for demonstration purposes during the meeting of the branch, and an invitation to visit the company's plant in Vancouver was cordially extended. Mr. Thos. Graham and others spoke of the benefit and convenience of having available so near to the coal-mining districts an available supply of oxygen instead of having to send to distant places for it. The secretary was instructed to acknowledge receipt of the letter and thank the manager of the company for having brought to the attention of the meeting the fact that oxygen is being generated and can be obtained in the City of Vancouver.

The courtesy of the Vancouver Mining Exchange in offering the use of its rooms for future meetings of the branch in Vancouver was also acknowledged with thanks.

The meeting was informed that the Branch Council is in favour of a resolution being adopted by the Branch to the effect that it is desirable a copy of minutes of meetings of the Council of the Institute, such as is sent to all members of the Council not present at its meetings, shall be similarly supplied to the chairman and secretary, of the Branch, respectively, so that the Branch may be kept informed concerning business coming before the Council of the Institute. After a brief discussion it was unanimously resolved that the meeting hereby approves the resolution of the Branch Council and authorizes the chairman and secretary to submit the wish of the members of the Branch in this respect to the Council of the Institute when they shall be in Toronto at the annual meeting in March.

It was resolved to authorize the appropriation of a sum of money for defraying out-of-pocket expenses of the chairman and secretary (additional to the travelling and hotel charges the parent Institute will pay) in connection with their attendance at the Annual Meeting of the Institute in Toronto.

The recommendation of the branch secretary that the next general meeting of the branch be held at Ainsworth and Kaslo—a daylight visit to some mines in Ainsworth camp and a night meeting at Kaslo for reading and discussion of papers, etc.—was approved, such meeting to be held about the middle of May next.

Proceedings at Afternoon Session.

At the afternoon session the attendance was good. An address by Mr. E. W. Parker, of the United States Geological Survey, on "The Coal Fields of the United States," was first on the programme. In this Mr. Parker stated that the coal fields of the United States are scattered over thirty different states and territories. The total area of the known fields aggregates approximately 310,000 square miles. In addition to these known areas there are about 160,000 square miles of which little is known, but which may contain workable coal, and about 32,000 square miles where coal probably exists, but under such heavy cover that it is not considered available as a present resource. The chief coal mining districts were then dealt with successively and their locality pointed out on a wall map. After much other interesting information had been given, Mr. Parker concluded with the following: "Mr. S. A. Taylor, in his presidential address before the Coal Mining Institute of America, at Pittsburg, in December, gave some estimates of the present coal supplies of the world. Those of the United States, exclusive of Alaska, amount to something over 3,000,000,000,000 tons. So little is known of Alaska that it is hazardous to make any estimate of its fuel supplies, but they can be put down certainly as 150,000,000,000 tons, making the total for the United States about 3,200,000,000,000 tons. According to estimates of the Royal Commission on Coal Supplies, Great Britain has a little over 160,000,000,000 tons. Including brown coals and lignites, Germany has 145,000,000,000 tons; Austria-Hungary, France, and Belgium, each has from 16,000,000,000 to 17,000,000,000 tons, and Russia about 20,000,000,000 tons. Canada's supplies are placed at 100,000,000,000 tons. The total supplies of all of Europe, according to the above estimates, are 375,000,000,000 tons, or about one-eighth of that of the United States." Mr. Parker then exhibited about thirty lantern slide views, which added greatly to the interest his important subject aroused in his hearers. The discussion that followed was participated in by Messrs. Sutton, Brewer, Sharp, and others.

Professor Daniels followed with a paper full of information relative to the "Roslyn Coal Field, in Kittitas County, Washington." This was also illustrated

by numerous lantern slide views, and gave much useful data and descriptive information relative to that comparatively small but productive field.

Two short papers were read by the secretary. The first of these gave cost data in connection with mining, milling, etc., of a small vein of free-milling ore, which information had been contributed by Mr. A. H. Gracey, mining engineer, of Nelson, B.C., with the expectation that it might prove of interest and value because frequently similar deposits are brought to the attention of mining men or representatives of capital, as prospects or partly developed mines. After detailing the conditions, etc., under which the work was done, the following was given as the cost of handling 13,958 tons of ore:

Mining—	Per ton.	
Stoping	$3.46	
Mucking	0.64	
Timbering	0.43	
Total labour	$4.53	
Supplies	0.51	
		$5.04
Milling		0.925
Cyaniding		0.725
Aerial tramming		0.16
Marketing product (concentrates and bullion)		0.135
Management, general expenses, insurance and taxes		0.675
Maintenance of plant		0.23
Total per ton		$7.92

The mining cost does not include the development cost of driving the main levels and connecting raises, which amounted to $1.90 per ton of ore extracted, but does include the cost of intermediate prospecting such as drifts and raises, and considerable of this work was necessary. Neither are there included interest on capital and depreciation charges. The maintenance of plant includes all repairs and additions necessary to keep the plant in an efficient condition.

Mr. Hedley commented appreciatively upon the results achieved in this connection by Mr. Gracey, under conditions which he knew to have been the reverse of favourable to such economic operation.

The second paper was "A Brief Description of the Electrolytic Lead Refining Plant of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, B.C.," of which refinery the writer, Mr. J. Miller, is superintendent. A few lantern slide views were shown, including one of the long tank room with its 240 refining tanks. This paper, too, was listened to with great attention, and was a welcome contribution to the day's proceedings.

Thursday Evening Session.

The evening session attracted a large audience. It was opened by Professor Roberts, who took as his subject, "Mining and Metallurgy on the Pacific Coast," and in dealing with this gave information concerning numerous mining fields. The free use of lantern slide views added greatly to the interest of this address, especially those showing gold dredgers at Natoma, California.

Mr. H. M. Wolflin contributed notes on "Some Work of the United States Bureau of Mines—Field Investigations, Mine Safety, and First Aid Work." After greeting the assembled members of the Canadian Mining Institute most cordially, as from the United States Bureau of Mines, Mr. Wolflin gave earnest assurance that it is the desire of the Bureau to co-operate with their friends in British Columbia in every way practicable, especially in mine-rescue work, the instructions received being that in emergencies the existence of a Boundary line between the United States and Canada is to be disregarded as far as possible. This address was also illustrated by lantern slide views, showing examples of much of the work of the Bureau in which Mr. Wolflin and his staff are engaged.

Mr. F. Napier Denison, who, at its Nanaimo meeting last year, gave the Branch much information concerning his investigations into the question of the possible relation of earthquakes, strains and stresses to coal mine disasters, added more notes on this subject, these being largely the concluions he had come to following the observations of another year. He again had the assistance of lantern slides to illustrate his address, and made mention of the Dominion Government having granted an appropriation to enable him to extend his investigations in connection with the subject he dealt with.

Hearty votes of thanks were passed to the several visitors from the United States, and to Mr. Denison, for their respective contributions to the proceedings of the meeting.

Friday Morning Session.

On Friday morning the session was opened by Mr. W. M. Brewer's address on the Marble Bay mine, Texada Island, and the Britannia mine, Howe Sound, two copper mines situated within easy reach of Vancouver. He narrated the history of each, outlined their later development, and pointed out that now they are profitable producing mines—the Marble Bay on a comparatively small scale and the Britannia in very much larger degree. These were instances of the success attending persistence in exploring the ore bodies occurring in the respective localities under notice, and object lessons in metalliferous mining in the Coast district.

Dr. McTavish spoke on the work of the St. John Ambulance Association, and commended it to mine-owners and others interested in mining as being well worthy of their active co-operation and support. Comments on this subject were made by Messrs. James Ashworth, Charles Graham, Thos. Graham, and W. F. Robertson. The meeting accorded Dr. McTavish a vote of thanks for having attended and given his address on this important matter.

The Groundhog Coal Basin.—A paper entitled "Notes on the Groundhog Coal Basin," prepared by Mr. G. S. Malloch, of the Geological Survey of Canada, and (with the kind permission of the director), sent from Ottawa for presentation at this meeting, was read by the secretary. The following is a short abstract:

"So far as known the coal measures extend northwest in a long strip, for at least 70 miles. The width of this strip at its southern end is about 30 miles, but it may not be so wide farther north.

"The coal measures have a thickness of upward of 3,000 feet, but contain coal in commercial quantities near the top and bottom only, though there are a few

thin seams in the intermediate beds. The lower horizon contains at least three seams of from four to six feet in thickness, and the thickness of the upper seams, seven in number, varies from two to six feet. So far as is known, the upper horizon is limited to an area of not much more than 20 square miles, but the lower extends over most of the above-mentioned strip.

"The coal is anthracite in character, but some of the available analyses show very high percentages of ash. Some of the seams have been so crushed that the coal shows numerous cleavage faces and powders badly when handled. In all the seams seen, veinlets of quartz or calcite traverse the coal in different directions. These veinlets are usually between a quarter and an eighth of an inch in thickness, and the foreign material almost invariably sticks to one or other of the pieces when the coal is broken. The number of points at which the coal has been opened are too few to permit of an estimate being made of the amount of the foreign material present, and it is quite possible some localities may be found where the coal is entirely free from it."

As regards transportation, Mr. Malloch showed that in order to obtain a market for coal from this field a railway will have to be constructed. He outlined three feasible routes. The shortest would be from Stewart, at the head of Portland Canal, from which place a railway has already been built twelve miles in the direction of this field. An extension of this short line would reach the broad valley of Naas River at 22 miles from the present terminus. The total distance from Stewart to the coal field would be about 90 miles. Another route from tidewater would be up the Nass River, but this would be 80 miles longer, though there would be much less rock work and an easier grade would be secured. A third route is from the Grand Trunk Pacific Railway at Hazelton, situated about 150 miles southward by a railway route. Then there is a distance of more than 150 miles from Hazelton to Prince Rupert, the Grand Trunk Pacific terminus, or a distance in excess of 300 miles from the coal field to that shipping port.

Mr. Malloch's paper was of particular interest, for the reason that the Groundhog coal field is receiving much attention in the Coast cities of British Columbia and elsewhere.

Development of Coal Areas in Alberta.—Mr. D. B. Dowling, also of the Geological Survey of Canada (with the permission of the Director) contributed some "Notes on the Progress of Development Work on Coal Areas in Alberta and Saskatchewan," which paper was read by the secretary. This gave information concerning progress made in the development of coal areas along the Grand Trunk Pacific Railway, chiefly at Jasper Park; in the coal horizon underlying and west of the City of Edmonton; on the eastern outcrop of the Edmonton coal formation; along the Grand Trunk Pacific Railway east from Edmonton; in the area west of Brazeau Range; on the continuation of the coal measures of the Cascade Basin southward on Kananaskis River, and on Luck Creek; at various places in Alberta reached by branches of the Canadian Pacific Railway, and others in Saskatchewan. To Mr. Dowling's notes Mr. Jacobs added some information he obtained late last year, giving a few particulars of progress made at the Jasper Park collieries, from which shipment of coal had been commenced.

Notes on Coal Mining in Western Canada.—As time was short, the notes he had prepared relative to the coal resources and development of coal mines in British Columbia and Alberta, were briefly summarized by Mr. E. Jacobs, who exhibited a number of lantern slides showing coal shipping docks, mine bankheads, views of general layout of surface works at coal mines, mine-rescue apparatus, etc.

Quoting from Mr. D. B. Dowling's paper on the "Undeveloped Coal Resources of Canada," read at the 1911 annual meeting of the Canadian Mining Institute, the following estimate was given: Area of coal fields, 1,351 square miles. Coal content: Anthracite, 61 million tons; bituminous, 39,674 million tons; lignite, 490 million tons; total approximate coal content, 40,225 million tons. Of this the greater part is in the Elk River field, East Kootenay, British Columbia, as follows: Elk River (Crow's Nest), 230 square miles, 22,600 million tons; Elk River north, 140 square miles, 14,000 million tons; total for Elk River district, 370 square miles, and 36,600 million tons.

Vancouver Island.—Western Fuel Company—Production in 1911, 580,000 tons, which is the largest quantity produced by this colliery in any year. Opening a new mine by shaft, at about four miles from Nanaimo; this will be developed to a producing capacity of 1,200 to 1,500 tons a day, and production may be expected to be commenced next autumn. Canadian Collieries (Dunsmuir), Limited.—Production in 1911 probably about 900,000 tons. Opening in Comox district a new shaft mine to be 1,000 feet deep and be ready for production in 1913; developing hydro-electric power, 11,000 h.p., chiefly for use of Union colliery mines, near Cumberland. Much other development and additions to plant and equipment. Pacific Coast Coal Mines, Limited.—Increased output capacity to 20,000 tons a month. Vancouver-Nanaimo Coal Company.—Adding to shipping facilities and plant.

Nicola Valley.—Nicola Valley Coal and Coke Company.—Increased its output from 41,000 tons in 1910 to more than 200,000 tons in 1911. Put in new tipple, capacity 1,000 tons a day; also much new plant. Important underground development work done; also found, with diamond drill, extensions of coal deposits into ground previously regarded as probably barren. Several other coal properties in Nicola Valley being developed.

Similkameen.—Princeton Coal and Land Company.—Put in additional coal-handling appliances, capacity 500 tons a day; also new machinery and plant. Did development work to provide for making enlarged output. Increased production in 1911 nearly 50 per cent. as compared with 1910. Columbia Coal and Coke Company.—Drove long crosscut tunnel which reached the coal. Railway transportation facilities provided; putting in plant for shipping coal.

Crow's Nest District.—Crow's Nest Pass Coal Company.—Opened three or four practically new seams at Coal Creek colliery; quantity and quality of coal both satisfactory. Reason to hope for success in efforts to provide for making output from company's Carbonado colliery mines. Had trouble at Michel colliery, but recent reports are that output there has been 1,000 tons a day, while Coal Creek mines have produced more than 4,000 tons a day. Hosmer Mines, Limited.—Opened seams at higher level, 500 feet above present main entry; connected new openings, by means of sur-

face tramway around contour of mountain side, with main tramway to shipping tipple and coke ovens; main incline recently double-tracked. Corbin Coal and Coke Company.—Beside mining coal underground from large deposit, up to 300 feet in width, opened enormous surface deposit at 800 to 1,200 feet above level of main entry, and at distance back of about 6,000 feet. Preparing to quarry out this surface coal.

Coal in Alberta.

Mr. Dowling's Estimate.—Coal area in Alberta, 29,608 square miles. Estimate coal: Anthracite, 400 million tons; bituminous, 30,250 million tons; sub-bituminous, 79,000 million tons; total, 109,650 million tons. Production in 1910: Coal, 3,036,757 tons; (less used in making coke, 196,249 tons); coke, 121,578 tons; briquettes, 108,996 tons; deaths by accidents, 61. Approximate production of coal in 1911, 1,600,000 to 1,700,000 tons (decrease was result of miners' strike for nearly eight months); deaths from accidents, 7.

Lantern slides showed views of various surface works at mines, Belgian ovens at Lille, and new bankheads at A. R. and I. Company's Nos. 5 and 6 mines; Lethbridge Collieries Company's new mine at Kipp; Chinook Coal Company's mine near Lethbridge, and others. Some of these modern steel bankheads and fine machinery equipments of power houses were briefly described, and information was also given concerning the chief collieries in Crow's Nest and Calgary districts the latter including Bankhead (Banff) and Canmore.

After some observations by Messrs. E. W. Parker, R. J. Drinnan, and James Ashworth, Mr. Jacobs drew attention to the better position British Columbia has reached in regard to loss of life in coal mines. Published statistical tables for the 10-year period, 1901-1910, show British Columbia average of persons killed to have been 9.21 per 1,000 employed, which was the highest in comparison with 20 of the United States and with Nova Scotia. For the 10-year period, 1902-1911, the proportion will be less than 7 killed per 1,000 employed, while for the 5-year period, 1907-1911, it will probably be found to have been less than 3 killed per 1,000 employed. This distinct change for the better should, he thought, be given as much publicity as possible, in justice to the officials of the Provincial Department of Mines, who have, during recent years particularly, done their utmost to ensure the safety of coal-mine employees.

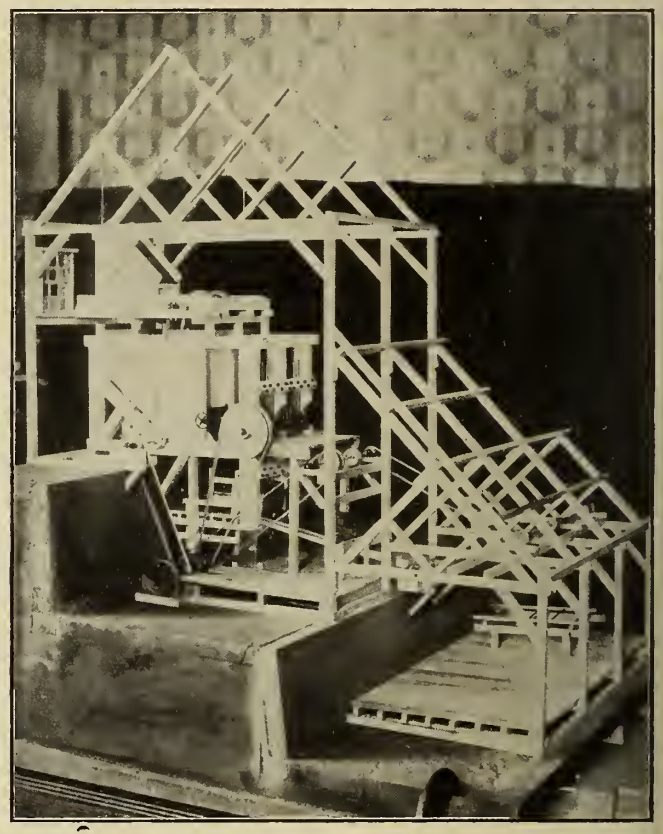
Votes of thanks to the Press of Vancouver, for having gratuitously given much publicity to the meeting of the Branch, and to the chairman and secretary for services rendered, brought to a close a successful and instructive meeting.

A STAMP MILL MODEL.

To Mr. J. W. Evans, Belleville, Ont., The Journal is indebted for the photograph reproduced herewith.

The model stands about 30 inches high. It is a complete and exact replica of a standard 10-stamp mill. The stamps are shod with chrome steel. Even the tiny screens are worked out to scale. The miniature concentrating tables, hardly a foot long, have been so carefully built that they are working smoothly and efficiently. The model will probably be moved to the Victoria Museum, Ottawa.

It will be remembered that Mr. Evans exhibited at Quebec, last year, the model of the Evans-Stansfield electric smelting plant. Both models display remarkable ingenuity.



DIAMOND DRILL RESULTS AT PEARL LAKE PORCUPINE, ONTARIO.

By G. W. Thomson, A.O.S.M.*

We have recently completed some diamond drilling on the property of The Pearl Lake Gold Mines, Ltd., the assay results, and the method I have used to average, present some new features, which I have thought to be of sufficient interest to lay before your readers.

The Ore.

The ore bodies on the surface consist of bands of quartz stringers in a mineralized schist.

The values are obtained only in the presence o quartz, this quartz varying from distinct stringers widening and combining in places to lenses severa feet thick, down to merely a silicification of the schist.

The chief mineral is iron pyrites in a very fin grained state.

Coarse visible gold can sometimes be seen in thes quartz stringers, but it is irregularly distributed, a shown by sampling results, which are erratic.

*Mining Engineer, General Manager, The Pearl Lake Gold Mines, Limited.

The mineralized schist between the stringers contains gold, also, differing from the stringers, however, in that the metal is more uniform and constant. It is exceedingly rare to see any gold in the schist.

Indications point to these ore zones having been originally fracture or shear-zones, forming channels of loose country through which the silicious and mineral bearing solutions were able to rise.

The gold, as a rule, appears to be secondary to the quartz.

The schist in these fracture zones is much contorted and of a talcy nature, merging off gradually into the regular schist on both sides.

The planes of schistosity are almost vertical, while the dip of the zones is 65 degrees to 68 degrees.

The drilling points to these structural conditions persisting in depth.

In one place where the ore body was silicified I was able to get the core almost intact, with little loss from abrasion, while in others where the ore body must have been composed of quartz stringers, 1 inch to 4 inches wide, in a soft schist, only short pieces of quartz were obtained, measuring, perhaps 8 inches over all, from 4 feet to 5 feet of ground gone through. When this happened the quantity of sludge obtained was from eight to ten times the usual quantity.

On these occasions the quartz pieces obtained in the core barrel were much rounded, resembling pebbles from a pebble mill.

Attached to some of these quartz pebbles in recesses or crevices were small pieces of the schist and from the feel and general appearance of these I judge that it was of a talcose nature. The schist could be easily picked out with a knife point.

The sludge was collected for each 5 feet all the way down, core samples were taken wherever the core looked promising, and if values were found, consecutive samples were assayed till values ceased.

The feature that I noticed particularly in regard to these samples was that the values in the sludges did not correspond with the richer sections of the core, but appeared to drag, or only show up, 5 feet to 10 feet (depending on the depth of the hole) past where the core was rich. This "drag", however, was more particularly noticeable after we had passed the ore, as indicated by the core samples; and it appeared to extend farther past the ore the deeper the point at which the gold bearing ore was cut.

"Drag."

This "drag" may be explained partly on the ground of particles being suspended in the water, but chiefly, I think, by the time it takes for the uprising current to raise the particles to the surface, the agitation caused by the rods does not permit the thought of much balancing or suspension of particles.

We had not an overabundant supply of water. The speed of the uprising current, I estimate was rarely more than 6 inches to 8 inches a second.

The sludge formed would, of course, vary greatly in size, from the smallest particles which would rise almost as quickly as the water which was carrying them, to other particles whose rate of dropping through water would be almost the same as the speed of the uprising water. These latter would take a long time to rise to the surface.

Particles which were too large to be lifted by the water would remain at, or near, the bottom until broken up.

Take a suppositious case of a hole 1,200 feet deep and of a particle whose rate of dropping through water is 5 inches a second with an uprising current of water at 6 inches a second. Under ideal conditions this particle would rise 1 inch a second and would take about 4 hours to rise to the surface. When going through ore, the drill frequently blocked and the rods had to be raised. The shortest run we had was half an hour; the usual number of times the rods were raised when in ore was from three to five times a shift of nine hours.

From the above it will be seen that most of the heavier particles, containing values, could not possibly have reached the surface when the rods had to be raised. Naturally, these fell back and had to start over again on re-entry of the rods, thus forming the "drag."

The gradual falling away in value of the sludge samples after productive core was passed, as seen from the tables later, appears to confirm this explanation.

This explanation is open to the criticism that possibly pieces from the softer section already gone through might have dropped down. This is possible, but we had remarkably little trouble from caves-in. As a matter of fact we were informed at once of any cave-in by our machines stopping.

I think, however, that the regular extension of this "drag", which, as I show later, varies directly with the depth of the hole, points to the fact that caves-in had not much to do with it.

Having recognized the existence of a drag, a method suggested itself, of arriving at an idea of the value of the ground passed through, especially in those cases when the core was almost entirely ground away.

The following are the core sample results on the occasion when practically all of the core was obtained:—

Table 1.

Depth in hole.	Length. Inches	Assay.	Dollar—inches.
324 ft.—326 ft.	24	$3.20	76.80
326 ft.—327 ft.	12	10.00	120.00
327 ft.—330 ft.	36	8.00	288.00
330 ft.—330 ft. 6 in.	6	2.40	14.40
330 ft. 6 in.—331 ft.	6	1.60	9.60
331 ft.—332 ft.	12	21.60	259.20
332 ft.—332 ft. 10 in.	10	14.40	144.00
332 ft. 10 in.—334 ft.	14	5.20	72.80
334 ft.—335 ft.	12	0.20	
335 ft.—336 ft.	12	Trace	
336 ft.—338 ft.	24	Trace	
Totals	120		984.80

The average, between 324 feet and 334 feet, where the values lie, is $8.20 per ton.

Table 1a.

The following are the sludge samples from the same locality in the hole.

Depth in hole.	Assay.	
320 ft.—325 ft.	Trace	
325 ft.—330 ft.	$4.40	$4.40
330 ft.—335 ft.	3.20	3.20
335 ft.—340 ft.	3.60	3.60
340 ft.—345 ft.	3.60	3.60
345 ft.—350 ft.	2.20	2.20
350 ft.—355 ft.	0.80	
355 ft.—360 ft.	2.20	
360 ft.—365 ft.	....	
370 ft.—375 ft.	0.60	
Totals 25 ft. (5 sections)		$17.00

I have discarded the samples from 350 feet to 375 feet as being possibly the result of a cave-in.

Referring to Table 1, it is evident that no values continue after 334 feet, and, yet, the Table 1a, of sludge samples, shows them to 350 feet at least.

I assume, therefore, that the values from 335 feet to 350 feet belong to the first ten feet and instead of dividing $17.00 by 5, to get the average, I have divided by 2, which gives a figure of $8.50.

This appears to be a fairly close check on the result by the orthodox method in Table 1.

The "drag" is here approximately 15 feet.

Table 2.

This table illustrates a case of where the core ground badly and the few harder, short, pieces that we did get showed practically no values, the sludge, however, carrying them.

Depth of Ground.	Length. Inches.	Actual Length. Inches.	—Assays— Core.	Sludge.
705 ft.—710 ft.	60	60		$1.20
707 ft.—708 ft.	12	12	Trace	
718 ft.—712 ft.	48	8	$1.20	
710 ft.—715 ft.	60	60		5.80
712 ft.—713 ft. 6 in.	18	No record (18)	2.00	
713 ft. 6 in.—718 ft. 6 in.	60	12	2.10	
715 ft.—720 ft.	60	60		5.80
718 ft. 6 in.—720 ft.	18	6	Trace	
720 ft.—724 ft.	48	12	0.80	
725 ft.—730 ft.	60	60		4.70
724 ft.—728 ft.	48	12	Trace	
728 ft.—732 ft.	48	18	Trace	
730 ft.—735 ft.	60	60		4.70
732 ft.—736 ft.	48	24	Trace	
735 ft.—740 ft.	60	60		5.80
736 ft.—740 ft.	48	10	Trace	
740 ft.—745 ft.	60	60		4.80
740 ft.—744 ft.	48	4	0.60	
745 ft.—750 ft.	60	60		5.20
744 ft.—748 ft.	48	48	Trace	
748 ft.—752 ft.	48	48	Trace	
750 ft.—755 ft.	60	60		5.80
752 ft.—754 ft.	24	24	Trace	
756 ft.—758 ft.	24	24	Trace	
755 ft.—760 ft.	60	60		5.20
758 ft. 8 in.—760 ft.	16	16	1.20	
760 ft.—762 ft.	24	24	Trace	
760 ft.—765 ft.	60	60		5.20
765 ft.—768 ft.	36	36		3.80

On examining carefully the above Table 2, and noticing where the core is obtained in its entirety an idea can be obtained of the approximate length of ore in the hole.

Core-sample 707—708 feet is whole, and assays a trace, previous core-samples to this were the same.

Core-sample 708—712 feet, really 48 inches of ground gives only 8 inches of broken core and assays $1.20.

Sludge-sample 705—710 feet assays $1.20 and sludge-sample 710—715 feet assays $5.80.

From these I judge that the ore began at about 710 feet.

The core-samples from this point to 744 feet were badly broken up (see table).

At 744 feet and on, the cores were obtained in their entirety. I judge therefore, that the ore is approximately from 710 feet to 745 feet, being 35 feet along the hole.

The sludge samples continued to contain values to the bottom at 768 feet.

The hole was stopped at this point on account of the barrenness of the core, which was intact, from 744 feet down.

Table 2a.

This table shows the method used to arrive at an idea of the average value of this section, viz., 710 feet to 745 feet.

Depth.	Length. Feet.	Assay.	Dollar-feet.
710 ft.—715 ft.	5	$5.80	29.00
715 ft.—720 ft.	5	5.80	29.00
720 ft.—725 ft.	5	3.80	19.00
725 ft.—730 ft.	5	4.70	23.50
730 ft.—735 ft.	5	4.70	23.50
735 ft.—740 ft.	5	5.80	29.00
740 ft.—745 ft.	5	4.80	24.00
745 ft.—750 ft.	5	5.20	26.00
750 ft.—755 ft.	5	5.80	29.00
755 ft.—760 ft.	5	5.20	26.00
760 ft.—765 ft.	5	5.20	26.00
765 ft.—768 ft.	3	3.80	11.40
Totals	58		295.40

Dividing the dollar-feet by 35, the length of the productive ground, as shown by the core samples, the value is $8.44.

The "drag" in this case amounts to at least 25 feet.

Table 3.

This is an occasion where the core showed some higher values, in this particular case, however, the results were obtained before I had realized the presence of the "drag." Thus I had not kept correct records of the actual length of the core assayed, although the records show that the core was badly broken up.

Depth in Hole.	Ground passed through.	Core Assay.	Sludge Assay.
644 ft.—647 ft. 6 in.	3 ft. 6 in.	.20	
653 ft.—653 ft. 6 in.	0 ft. 6 in.	.40	
655 ft.—660 ft.	5 ft. 0 in.		$3.20
656 ft. 6 in.—657 ft.	0 ft. 6 in.	.40	
657 ft.—657 ft. 3 in.	0 ft. 3 in.	$5.20	
657 ft. 6 in.—658 ft. 4 in.	0 ft. 10 in.	10.20	
659 ft. 0 in.—659 ft. 2 in.	0 ft. 2 in.	58.40	
660 ft.—661 ft.	1 ft. 0 in.	.40	
661 ft.—661 ft. 6 in.	0 ft. 6 in.	2.00	
661 ft. 9 in.—663 ft.	1 ft. 3 in.	.20	
663 ft.—664 ft.	1 ft. 0 in.	6.00	
664 ft. 6 in.—665 ft. 1 in.	0 ft. 7 in.	.20	
660 ft.—665 ft.			8.80
665 ft.—670 ft.			6.40
670 ft.—675 ft.			4.40
674 ft. 6 in.—675 ft. 6 in.	1 ft. 0 in.	1.20	
676 ft.—676 ft. 10 in.		.40	
675 ft.—680 ft.			2.40
676 ft. 10 in.—678 ft.	1 ft. 2 in.	.20	
679 ft. 3 in. 680 ft.	0 ft. 9 in.	.20	
680 ft.—680 ft. 6 in.	0 ft. 6 in.	.20	
680 ft. 6 in.—681 ft.	0 ft. 6 in.	.20	
680 ft.—685 ft.			Trace

The core apparently began to be productive at about 655 feet and continued to about 664 feet.

There is a section between 674 feet—6 inches and 675 feet 6 inches which assayed $1.20. This can, however, be neglected on account of its low value which could hardly affect the sludge samples very materially.

Table 3a.

The sludges, it will be seen, contained values from 655 feet to 680 feet, while the core showed values from 655 feet to 665 feet 1 inch, approximately 10 feet.

SLUDGES.

655 ft.—660 ft.	$3.20
660 ft.—665 ft.	8.80
665 ft.—670 ft.	6.40
670 ft.—675 ft.	4.40
675 ft.—680 ft.	2.40
	$25.20

As the core only shows values for about 10 feet, divide the $25.20 by 2 instead of 5, and the result is $12.60 per ton for 10 feet of the hole.

The drag is 15 feet only.

Table 4.

This is an ore zone at quite considerable depth. There were no other mineralized valuable zones above this.

Depth.	Length of sample. Feet.	Actual length sample. Feet.	Core assay.	Sludge sample.
1150 ft.—1155 ft.	60	..		Trace
1155 ft.—1160 ft.	60	..		$4.50
1154 ft.—1156 ft.	24	5	Trace	
1158 ft.—1159 ft.	12	6	$0.40	
1160 ft.—1165 ft.	60	..		4.40
1160 ft.—1162 ft.	24	9	0.40	
1164 ft.—1166 ft.	24	24	6.00	
1165 ft.—1170 ft.	60	..		Trace
1168 ft.—1169 ft.	12	12	9.20	
1170 ft.—1172 ft.	24	4	0.40	
1170 ft.—1175 ft.	60	..		4.00
1172 ft.—1174 ft.	24	20	2.20	
1175 ft.—1180 ft.	60	—		8.40
1176 ft.—1176 ft. 2 in.	2	2	21.60	
1176 ft. 2 in.—1178 ft.	22	20	4.20	
1180 ft.—1185 ft.	60	..		8.00
1180 ft.—1182 ft.	24	22	1.20	
1185 ft.—1190 ft.	60	..		6.20
1184 ft.—1187 ft.	36	12	0.20	
1190 ft.—1195 ft.	60	..		3.60
1195 ft.—1200 ft.	60	..		3.60
1200 ft.—1205 ft.	60	..		2.40
1205 ft.—1210 ft.	60	..		2.00
1210 ft.—1218 ft. 6 in.	102	..		2.20

On examination of the above table 4 it will be seen that the values come in at 1,155 feet and cease at 1,182 feet.

The core-sample 1,180—1,182 feet was nearly intact and for the remainder of the hole to 1,218 feet 6 inches the core was very good, practically the whole of it being obtained.

The hole was stopped on account of the barrenness of the core below 1182 feet.

The values extended over 27 feet of the hole apparently.

Table 4a.

The value of this section was calculated from the sludge samples as follows: —

Depth in hole.	Length of sample.	Value.	Dollar—feet.
1155 ft.—1160 ft.	5 ft. 0 in.	$4.50	22.50
1160 ft.—1165 ft.	5 ft. 0 in.	4.40	22.00
1165 ft.—1170 ft.	5 ft. 0 in.	Trace (.10)	.50
1170 ft.—1175 ft.	5 ft. 0 in.	4.00	20.00
1175 ft.—1180 ft.	5 ft. 0 in.	8.40	42.00
1180 ft.—1185 ft.	5 ft. 0 in.	8.00	40.00
1185 ft.—1190 ft.	5 ft. 0 in.	6.20	31.00
1190 ft.—1195 ft.	5 ft. 0 in.	3.60	18.00
1195 ft.—1200 ft.	5 ft. 0 in.	3.60	18.00
1200 ft.—1205 ft.	5 ft. 0 in.	2.40	12.00
1205 ft.—1210 ft.	5 ft. 0 in.	2.00	10.00
1210 ft.—12.18 ft. 6 in.	8 ft. 6 in.	2.20	18.70
Total	63 ft. 6 in.		254.70

As the values, as seen from the core-samples, extended over 27 feet the above works out to an average of $9.43 per ton.

The "drag" in this case appears to be at least 35 feet, it would, no doubt, have been slightly longer if the hole had been continued, but owing to the barrenness of the core from 1182 feet down, it was stopped.

Summary of the Holes.

Table.	Depth.	Length of Drag.	Angle of Hole.
1	320 ft.	15 ft.	Inclined at 76 degrees.
2	705 ft.	25 ft.	Inclined at 76 degrees.
3	655 ft.	15 ft.	Vertical hole.
4	1155 ft.	35 ft.	Vertical hole.

Tables 1 and 2 give proportionately slightly longer drags than Nos. 3 and 4, due, no doubt, to the fact that these were from an inclined hole.

General Remarks.

No claim is made that this method of averaging gives accurate results, but I do think that it gives a fairly close approximation, the best that can be obtained under the circumstances.

At first glance it is certainly startling to see an average value, greater than any of the values from which it itself has been calculated.

The outcrops of these ore bodies, indicated in the bore holes, are on a neighbouring property, and I have not accurate sampling results of them there.

A few samples, taken by permission, have, however, yielded results from $2.00 to $56.00.

For further drilling for ore bodies of this nature I would have very close records kept, of the actual length of core obtained for the ground gone through, and the weight and volume of the sludge samples carefully taken; from this information a more accurate idea of the value of the ground gone through could, perhaps, be worked out.

INTERNATIONAL GEOLOGICAL CONGRESS.

The fact that the International Geological Congress, whose 12th annual is to be held in Toronto, meeting in Canada for the first time in its history, does not mean that Canada has been backward in its support of this important organization. On the contrary, Canadians were in the forefront of its inauguration, which was inspired during the 1876 Philadelphia Exposition. At a scientific meeting held at the end of this exhibition a committee was appointed to meet in Buffalo and arrange for an International meeting of geologists to be held in France at the forthcoming Paris Exhibition in 1878.

This committee was called the Comite Fondateur, and the proposed organization named the Congres Geologique International. The Comite Fondateur was replaced by the Comite d'Organization, composed of French geologists, to whom the arrangements for the first meeting were entrusted. This pioneer Comite Fondateur was composed of eleven members, of whom Mr. James Hall, of Albany, U.S.A., was president, and Mr. T. Sterry Hunt, of Montreal, Canada, was secretary. Mr. J. W. Dawson, of Montreal, afterwards knighted for his eminent scientific services, was also a member of the committee.

Those responsible for the Paris Exhibition of 1878, did not confine their scientific interests to geology, and the first meeting of the International Geological Congress was really one of a number of international scientific meetings.

The first meeting of the Congress, held in Paris in 1878, was one of a series of international meetings on scientific and technical subjects, and was an unqualified success. It was international in actuality as well as in name. Twenty-three countries sent representatives, those of Canada being Messrs. Selwyn, F.R.S., Director, and T. Sterry Hunt, member of the Geological Survey, with M. Paul de Caze, the Canadian Government's official representative at the Exposition.

The objects of this first congress were chiefly to make rules for a uniform system of mapping, and the nomenclature and classifications used in geology, and to discuss geological topics of international interest. Since then other objects have been added, but all with a single eye to the one principal of making the geologist's work in one country not only intelligible, but also of the greatest possible use and interest to his fellow-geologists in every other country of the world.

REPORT OF DEPARTMENT OF MINES OF NOVA SCOTIA FOR 1911

(Continued from last issue.)

Gold Mining.

The gold production for the year is the smallest since 1862. The direct cause for the small production may be attributed to the closing down of the Richardson mine at Goldboro and the Oldham-Stirling mine at Oldham.

In all, 18,320 tons of gold-bearing rock was mined and crushed, producing 8,389 ounces, 12 dwts. and 4 grs. of gold. This is valued at $159,411 (at $19.00 an ounce), being an average yield of $8.70.

Operations were carried on on 21 properties in 18 districts. In very few cases, however, were operations carried on during the whole year. Much of the work was done by tributors.

The report contains detailed description of work being done on the different properties.

Tungsten.

Prospecting for the tungsten-bearing ore, scheelite, has been carried on at a number of places in the Province with promising results, notably at Waverly, Halifax County; Fifteen-Mile Brook, Queen's County, and New Ross, Lunenburg County.

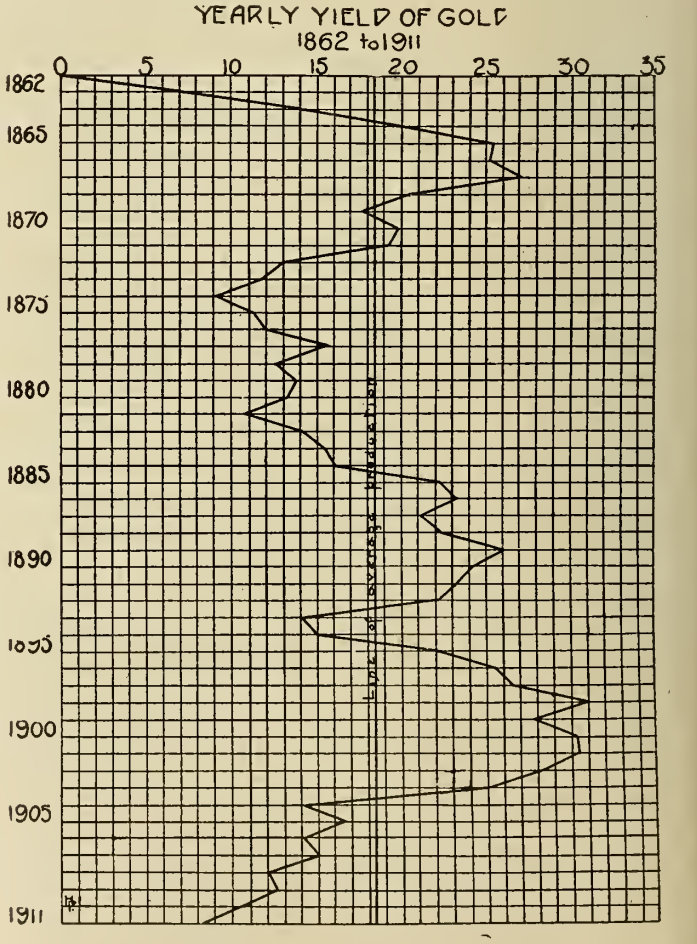
At Fifteen-Mile Brook, Mr. E. R. Faribault, while engaged in field work, discovered scheelite in a quartz vein a short distance north of where numerous pieces of drift had been previously found by Mr. W. H. Prest.

At Scheelite, Moose River, Halifax County, the Scheelite Mines, Ltd., has engaged in mine development and construction of surface equipment and concentrating facilities. Their concentrating mill is now almost completed and they expect to have it in operation by the first of January, 1912. [Editor's note.—The mill has been operating irregularly since the middle of January.] The mill has a capacity of 30 tons per 24 hours. The report gives a description of mill practice as well as a description of the mine and plant.

Barytes.

At Scotsville, East Lake, Ainslie, Inverness County, the Byrites, Limited, is operating on a 9½-foot vein of barytes. The mine is well developed and timbered and yields an excellent grade of sulphate of barium, an analysis of crude ore giving 98.25 per cent.

A plant for grinding and washing is being installed. The capacity of the plant is said to be one ton of finished product per hour.



Gypsum.

Ten miles east of Eastern Harbour, Inverness County, the Great Northern Mining and Railway Company, Ltd., has a mill and two quarries in operation. The description of the property includes notes on quarries, equipment, mill and shipping facilities. (See page 6a.)

Iron.

The amount of iron mined during the year was 53,995 tons, a slight increase over the output of 1910. The Canada Iron Corporation, at Torbrook, was the only operator, all the ore used by the Nova Scotia Steel and Coal Co. and the Dominion Iron and Steel Co., being imported. This amounted to 853,904 tons, of which 831,660 tons came from Newfoundland, 15,734 from the United States, and 6,509 from Europe.

Of the ore mined at Torbrook, 200 tons were shipped, 357 tons sent to concentrator, and the remainder put on stock pile at the mine. The total amount of ore on hand at Torbrook and Port Wade is now in round figures 110,000 tons.

A modern concentrating plant is being erected by this company at Nictaux.

Auriferous Antimony.

The West Gore Antimony Company at West Gore, did not operate its mine during the year and the production of 191 tons of concentrates made and shipped was from the milling of 2,004 tons from dump.

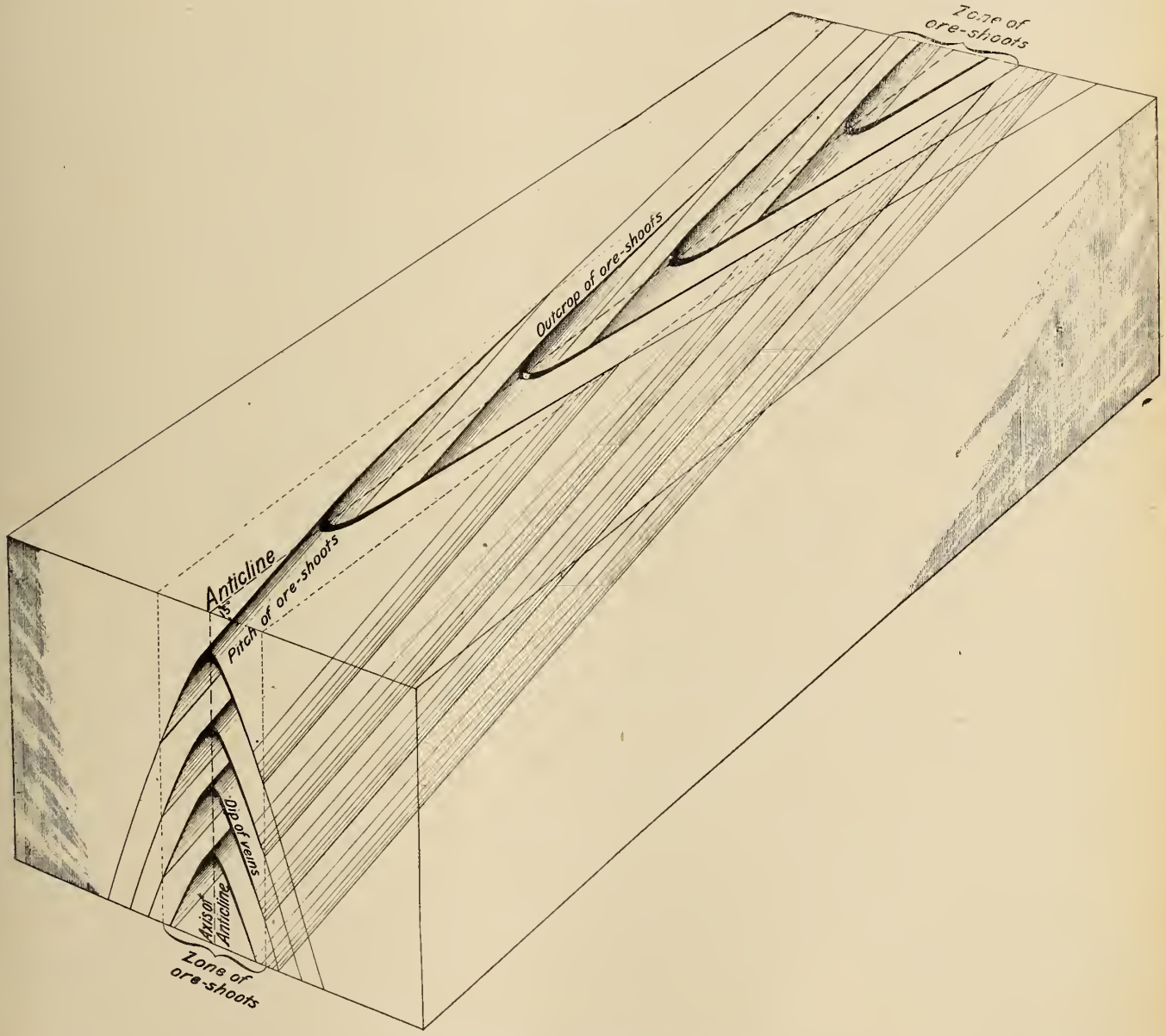
This company has for the past two or three years been engaged in litigation with respect to titles. It is stated that a settlement has been reached and that mining operations are to be resumed during the coming year.

Manganese.

But one company was engaged in connection with the mining of this mineral, namely, the Nova Scotia Manganese Company at New Ross.

This company has been actively engaged in mine development, and in the erection of surface buildings and placing equipment.

High grade pyrolusite, such as the product of this mine, is used by glassmakers, paintmakers, steelmakers, electrical equipment makers, and manufacturing chemists. The poor grades or run-of-mine product being taken by the steelmakers, and the highest grade, or what is known as air-float product, being taken by the manufacturing chemists.



Ideal Projection of Scheelite Measure

As yet no ore other than for test purposes has been shipped. The operators state that reports so far received are most satisfactory.

Tin.

Prospecting for this mineral at the New Ross District, carried on by A. L. McCallum, et al., during the summer of 1910, was continued during the spring and early summer. Additional prospect shafts were sunk and considerable surface trenching done. Tin ore in economic quantities was not met, and the work has been discontinued.

Government Drills.

There were 14 holes put down, making the total number of feet bored 4,618 feet 8 inches, a decrease of 1 hole and 602 feet 11 inches when compared with the boring of the previous year. Of the holes put down 10, or 3,134 feet 4 inches bored, were by diamond drills, and four or 1,484 feet 4 inches bored, were by Calyx drills.

Several holes had to be abandoned on account of caving, but no holes were lost, and the holes abandoned were in very badly faulted structure.

The average cost per foot for all boring was $1.28, an increase of $0.29 over the average cost of last year.

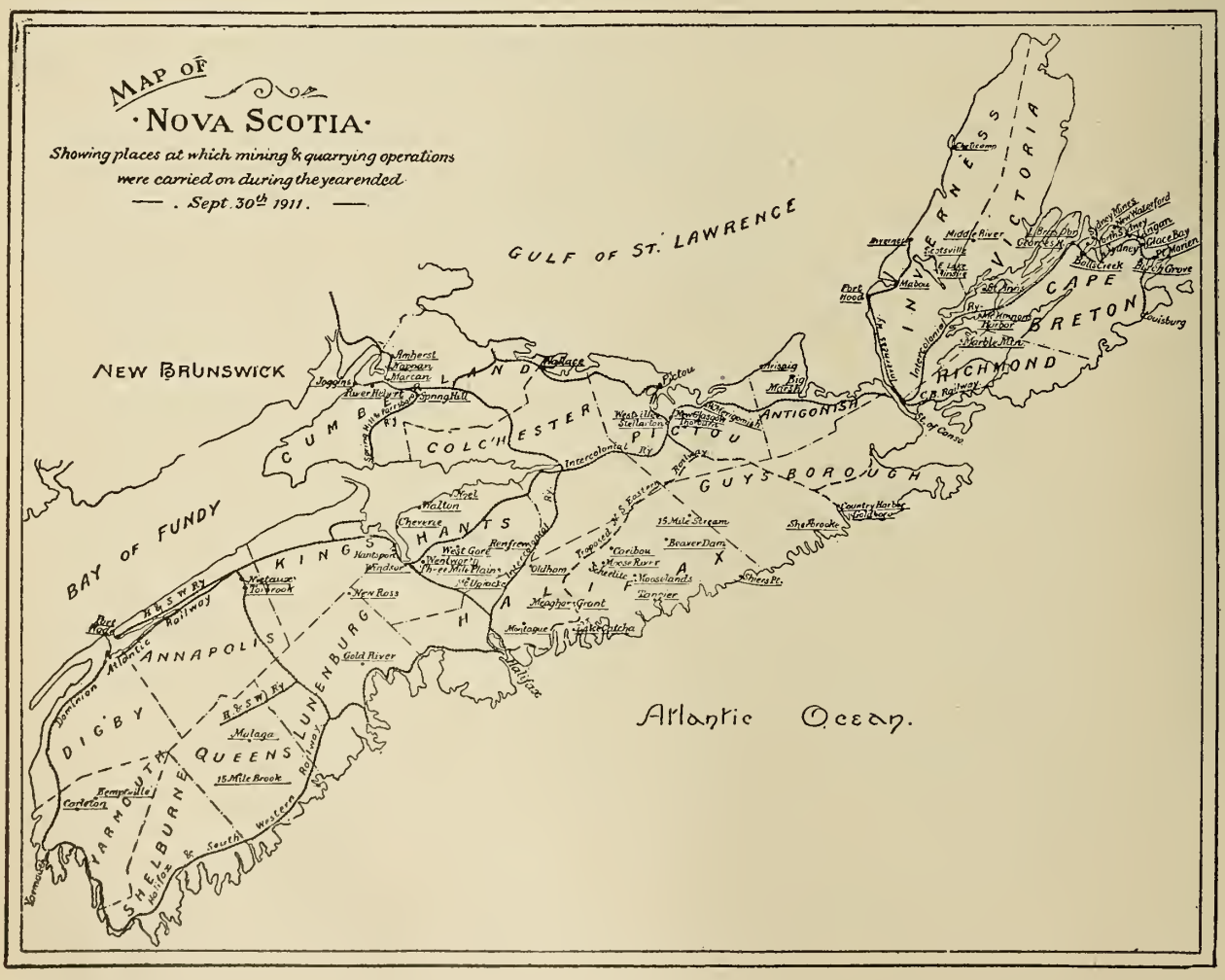
Boring costs, compared with the cost of 1909-10, show as follows:

	1910.	1911.
Cost per foot for all boring	$0.99	$1.28
Cost per foot by diamond drills	0.93	1.30
Cost per foot by Calyx drills	1.44	1.25
Shot cost per foot	0.02	0.046
Carbon cost per foot	0.067	0.096

New Ross Manganese Mill

The cost of diamond drilling was increased by the work done in faulted and caving ground at the Moose River Gold mines. Here 41 feet 8 inches of hole drilled cost $6.20 per foot. At Stellarton, delay in getting casing increased the cost of a 284-foot hole, and $3.26 per foot.

The cheapest drilling by diamond drill was in a 2-inch hole in the vicinity of Stellarton. This hole was 705 feet deep in sandstone and shale, and cost $0.70 per foot. The cheapest work by the Calyx drill was a 6-inch hole at Big March, Antigonish County. It was 827 feet deep in sandstone, conglomerate and shale, and cost $1.07 per foot.



TAXATION AFFECTING MINING IN BRITISH COLUMBIA.

From the report of the provincial commission on taxation in British Columbia, which sat last autumn in various parts of the province, and the report of which was presented to the Legislative Assembly on January 22nd, the following information directly affecting the mining industry, as printed in the Victoria Colonist, has been obtained:

"**Coal Land Tax.**—One per cent. on assessed value on worked mines, two per cent. on unworked mines.

"Many witnesses directed the attention of the commissioners toward the disparity between the cost of coal at the mine-head and the price paid by the consumer.

"Appeals to be relieved from the tax on coke were also urged.

"The commissioners refer the evidence regarding the cost of coal to the consideration of the Government. They recommend that the tax on coke be reduced from 15 cents to 10 cents a ton.

"**Mineral Tax.**—Two per cent. on assessed value of ore. Revenue for the year 1910-1911, $91,038.43.

"The report describes the system in vogue in the province of taxing minerals, and draws attention to the present market value of copper.

"Complaints of witnesses were generally directed towards the inequality of the tax as between high-grade and low-grade ores. A suspension, or alternatively, a reduction, of the tax was asked for.

"The commissioners do not recommend any change in the tax imposed on minerals.

"**Tax on Crown-granted Unworked Mineral Claims.**—Revenue for the year 1910-1911, at 25 cents per acre, $42,020.84.

"Upon the evidence as adduced before them, the commissioners are of opinion that this tax is fair and reasonable.

"**Revenue (or Poll) Tax.**—Revenue for the year 1910-1911, $313,338.

"After consideration of this tax from historic and economic points of view, the report proceeds to show that the evidence for and against it was varied and voluminous, and the commissioners have set forth at length their reasons after considerable deliberation, for recommending the abolition of this tax.

(Note.—The Poll Tax affects workers in mines in common with all other "male persons over eighteen" in the province.)

ONE EXCURSION.

The last member of a party of American mining engineers who went to Mongolia two years ago has just returned to New York, their enterprise having been abandoned after almost a million dollars was sunk in it by Russian and French capitalists.

The engineers were employed to investigate reports that certain parts of Mongolia were rich in gold. The site of the operations was in the highest region of the country, at the confluence of two rivers with systems of affluents, all of which were conjectured to be rich in deposits of gold dust and nuggets washed down from the mountains during millions of years.

The engineers, 37 in number, took with them machinery of the latest type, including dredges built in this city and barges built in Pittsburg.

On their way inland, they were attacked by Chinese bandits, and in a pitched battle the party's rifles killed 47 of the robbers.

Eighteen others were taken prisoners and turned over to the nearest mandarin who promptly beheaded them. James Dietrich, a Pittsburg engineer, has an interesting collection of photographs, taken at this point, showing, in succession, each one of the eighteen prisoners as the sword was about to fall.

Only small quantities of gold were found by the expedition, and the cost of mining this was about $5 an ounce more than the market value of the refined gold.

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt, Gowganda and South Lorrain.

[Editor's Note.—In our last issue the discovery in the Keewatin at the Coniagas mine, Cobalt, was reported to have been made without the mine captain's knowledge. We are assured by the management that this is a mistake. Captain Martin was responsible for this find and deserves credit for following into the Keewatin.]

The extension of the No. 9 vein of the Coniagas into the Keewatin, the striking of rich ore on the Casey Cobalt and the cutting of lead carrying high-grade silver at the Silver Leaf promise to arouse more interest in exploration work in the Cobalt camp and its vicinity than for years past. The drift along vein No. 9, half way up the stope from the 75-foot level in the Coniagas, is still in good ore at 160 feet from the contact. It is estimated that there is already in sight a carload of ore from the extension of the vein in the Keewatin and the returns from this will be devoted to discovering if this enrichment of the vein in an unexpected quarter is a freak or if it may be looked for at other levels. So far no raising or sinking has been attempted and so no information is to hand as to the depth of this streak of ore. The drift will be run beyond the contact on the 150-foot level, and if good values exist there too, it will give the possibility of unsuspected ore reserves for the companies operating along the West Ridge.

At Kerr Lake, after the Crown Reserve has operated the Silver Leaf for two years and a half, definite and promising results are reported from the 475-foot levels. It is stated that twenty feet from the Crown Reserve boundary a rich stringer has been cut and that another and a larger but leaner streak of ore has been also cut. This find also will once more raise hopes of discovering ore in some of the abandoned mines.

Until Mr. John Redington took charge of the Townsite and the Casey Cobalt mines two years ago, the former had been entirely unproductive, although mining had been going on steadily for six years. Since he left the property has been shipping a considerable tonnage and has been more than paying its way. It is now reported that at the bottom level some remarkably rich ore has been found and it is possible that operations may extend to other portions of Casey Township or to a few

spots where the rock outcrops. In the general Cobalt boom the Casey was staked because it was conglomerate rock and the shaft was put down on a smaltite vein not very rich in silver. The company is controlled in England and the news of the discovery was known there long before it was allowed to be published abroad in Canada.

The Nova Scotia mill has shut down until such time as a radical alteration can be made in the flow-sheet. The process was designed to treat silver as it occurs in the diabase in the Cobalt district for the most part as leaf silver distributed in the wall rock. When the Nova Scotia's own ore was exhausted, contracts were made with the Kerr Lake and the Crown Reserve, and about 120 tons per day have been treated every day from the dump heaps of these two mines. It has now been found that at the present contract rates the operation was not remunerative and the mill is being thoroughly overhauled and adapted to meet conditions as they exist in the more complex ores to be found in the Keewatin and conglomerate. It is a remarkable tribute to the continued productivity of the Cobalt camp that there is not a single stamp idle and but one mill, that at the Silver Cliff where rolls are used for crushing.

Fifteen tons of very rich ore have been shipped out of the Mann mine at Gowganda. The ore was taken from an old open cut on this property, which up till a few months ago had been shut down a year and a half, or since the Gowganda boom. It is a peculiar fact that native gold, not in commercial quantities, has been found in the silver vein.

Tenders for contracts on the Elk Lake branch of the T. & N. O. Railway are to be submitted on March 30th, and construction will be commenced at once. In the meantime there is considerable stir at Elk Lake again and the Donaldson and other companies have ordered plants. The Donaldson is reported to be mining good ore.

In February, the Nipissing production was $226,419 net, while the shipments reached $545,559. This is the largest amount that the Nipissing has ever shipped out in one month and certainly the most that any Cobalt mining company has despatched in the same period. There were favourable developments on the Meyer and No. 100 veins, 57 feet being added to the stoping length of the Meyer and a considerable block of additional ore being actually put in sight at No. 100 vein. Excellent progress is being made with the new mill.

It is stated that development in the conglomerate formation at the 300-foot level of the Cobalt Provincial is getting very good results. The vein being drifted upon is about two inches wide of high-grade ore and four other veins with possibilities have been cut.

The shipments of bullion from the Cobalt camp up to the end of February reached 1,052,935 ounces, of a total value of $619,820. To this total the Nipissing has contributed about two-thirds. It is stated that the Ophir Cobalt will pump out the shaft and recommence operations this month. Some of the unissued stock has been sold and another attempt will be made to make a mine of the property. It has been shut down since last August.

With the dividend of 5 per cent. paid on March 15th. the Crown Reserve has now returned to original stock holders 220 per cent. on capitalization, or $3,959,821. The new find on the Silver Leaf lease is being vigorously explored and some good ore is being taken out.

Porcupine, Swastika and Other Gold Districts.

There is as yet no whisper of the new district that has year by year drawn and maintained the interest of the prospector in Northern Ontario. The Hurricane failed to enthuse anyone. There is little doubt that one or two ships will leave Newfoundland this winter for the rumoured placer field on or near Ungava Bay. The Donaldson expedition turned back after penetrating but twenty-three or twenty-four miles north of the Trancontinental Railway, and it is but crediting them with ordinary common bush sense to believe that they had some less arduous objective than the Ungava wilds. It is certain that they were outfitted rather for a permanent camp than a wild rush across 900 miles of country, breaking their own trail as they went. Dane, also, is scarcely the spot that adventurers in the far north would have chosen to leave their base of supplies. It is probable that the first man to prospect the ground where it is once more rumoured that placer has been found, will be Mr. Robert Flaherty, who is already on the ground and will, when the snow goes, strike east, probably along Leaf River and Minto Lake to Ungava Bay. He will thus have a formidable start over all competitors. Meanwhile the Porcupine camp is definitely getting down to business. The McIntyre mill had hardly commenced to drop stamps (they had but run 174 hours) when the Porcupine Power Company cut off the power from all but their contract customers, and the milling operations were perforce stopped for some time. But at the Dome the 400-stamp mill is gradually getting into tune and during the third week in January, stamps were dropped for the first time, not to crush ore, but as an experiment. There is no question but that the mill will be ready and running by March 30th, when the big demonstration is planned. To visitors it will be an added inducement that the underground workings of the Dome will be exposed to the public eye for the first time through the hours of nine till one in the forenoon. This should be considered a privilege since the same advantage was denied two weeks earlier to one of the most representative groups of American and Canadian engineers.

The low water on the Mattagami River and the consequent failure to deliver power from the Porcupine Power Company at Sandy Falls will be a very disturbing factor to progress in the Pearl Lake section as long as it continues. For one day all the mines supplied were without power, now some half-dozen are affected, so that while they can still keep the mines dry, little progress can be made. The companies most affected are the Plenaurum, the Jupiter, the Moneta and the McIntyre. The Hollinger, the Vipond and the Pearl Lake, being contract customers, are being supplied with current and the former have either returned to the steam plant they were using originally or are renting air from a neighbour. The Dome has sufficient steam power to meet all its present needs, but will certainly obtain power from some source at the earliest moment. The Porcupine Power Company has already sold most of the current it can deliver at high water, and the necessity for the completion of the Waiwaitan Falls plant is being felt. As soon as Mr. A. E. Wallberg can get clear of his financial difficulties and can deliver power he will find plenty of customers.

The first annual report of the Northern Ontario Exploration Company, of which Bewick-Moreing Company are general managers, shows that operations in Porcupine and elsewhere gave a net profit of $357,405. The directors have written off $200,000 from the cost price of the shares. The report indicates that the company is likely to divert its energies from Porcupine, where its success was but moderate to Alaska.

A distinguished party of mining engineers and writers on mining affairs visited the Porcupine and Cobalt camps last week, as guests of the Canadian Mining Institute. They were T. A. Rickard, editor of the Mining Magazine, of London, and owner of the Mining and Scientific Press, of San Francisco; Theodore Dwight, of New York; J. L. Garrison, consulting engineer of Philadelphia; N. V. Noris, coal mining expert of Wilkesbarre, Penn.; W. R. Ingalls, editor of the Engineering and Mining Journal, of New York; H. W. Hardinge, inventor of the Hardinge mill; Harry Kehoe, Spokane; Prof. F. H. Sexton, Halifax, director of the Technical College of Nova Scotia,

and E. Jacobs, secretary of the Western Branch of the Canadian Mining Institute. The party, accompanied by eminent Canadian engineers and geologists in the capacity of guides, came direct to Porcupine where they examined the Hollinger and the Dome. At Cobalt they had more time and went through the Coniagas mine and mill, the Temiskaming mine and mill, the Trethewey mine and mill, and the Nipissing mill.

After a protracted search the No. 3 vein of the Vipond has been cut and is now being drifted upon. This is at the 200-foot level. The vein was reported cut some time ago, but it was discovered that a mineralized zone of no great value had been encountered. The vein, as it now shows in the drift, is from four to five feet wide and appears to be of much the same grade of ore as at the 100-foot level, where it ran over $11.

Before the power was cut off the McIntyre mill, the first to drop stamps in the camp since the fire, had run about 200 hours on lean ore. It first commenced to crush on March 1st and since then the 10-stamp plant has been making about $500 per day from the plates and another $50 in the concentrates. The process is merely experimental, being simply amalgamation and concentration of the tailing. The tails are at present only running about 50 cents to the ton. A clean-up house is now being built and before the end of the month the first gold bar should be shipped.

Prospectors who have wintered in the south are beginning to come back and are going out on their claims to do the work. Several good surface finds are reported from Swastika.

Crosscutting for the vein at the 400-foot level of the Rea has been in progress for some time, but so far the ore body has not been picked up. The work of sinking the shaft was carried out very expeditiously and the mine has been thoroughly resampled at all its levels and in all its workings.

Work on the Dome Lake property is making good progress. Two shafts, both on the vein, have been sunk to the 50-foot level and assays running over $20 per ton have been taken from the bottom of both shafts. Drifts are now being run from both shafts to connect up the two workings. Two diamond drills are operating on the property.

GENERAL MINING NEWS

QUEBEC.

Montreal, March 20.—At the adjourned annual meeting of the Amalgamated Asbestos Company this afternoon, the old directors, with the addition of Messrs. Doucet and Cook, were re-elected until March 31, when the Royal Trust Company will take over the concern, to reorganize it for the benefit of the bondholders, for whom it is acting as a trustee. The terms have been previously announced.

ONTARIO.

The Elk Lake branch of the Temiskaming & Northern Ontario Railway which was promised by the Provincial Government during the recent campaign, is to be placed under construction at once. The line is to run from Earlton to Elk Lake, thirty miles, and the successful tenderers are Messrs. McCaffery and McQuigge, of Toronto. Their tender, $180,000, was the lowest of twelve received, some of which, it is understood, were from foreign contractors. "The gradient of the new road," said Commissioner J. L. Englehart, "will be better than that of our main line, six-tenths of one per cent. being the maximum grade. The contract calls for the construction only of the roadbed, for ties and rails will be laid by the Commission. Work will be begun as soon as the contractors can start the contract calling for the completion of the work by September 1st. It is expected that the line will be in operation this year."

Elk Lake, March 15.—The syndicate which purchased the Hitchcock property has lost no time in getting to work. The buildings are now ready for occupation and the machinery is being put in place ready for work. The option agreement provides for an expenditure of about $40,000 in development on this property and will insure steady work for a year to complete the requirements.

South Porcupine, March 17.—Within the past two days the Vipond has cut its No. 3 vein at the 200-foot level. At about 80 feet from the crosscut the vein extends right across the face of the drift, and has every appearance of making as good ore as on the 100-foot level, where it ran over $11. It was reported that No. E 3 vein had been cut some time ago, but this was afterwards found to be a mineralized zone, giving low assays, and not directly related to the main vein.

Six hundred and fifteen tons of ore have been shipped from the McKinley-Darragh mine since January 1st. The two new veins, discovered under the swamp in the unexplored section of these holdings, average about three inches in width, and have been giving values of 2,500 ounces to the ton. Another important vein has been discovered in the second swamp at the 150-foot level, and this mine is proving itself to a considerable degree.

Cobalt, March 21.—The new plant has been installed on the property of the West Coleman Silver Mines. This plant was rushed in before the spring break-up of the snow roads, and considerable yet remains to be done before actual development can proceed. Camp buildings for the accommodation of a considerable force of men are being erected on the Porcupine Kendall property in Deloro Township, Porcupine. As soon as they are completed diamond drilling will be commenced to determine the values existing at depth on the property. Good surface assays have been obtained where other bodies have been stripped. The underground work at the Dominion Silver property has been temporarily suspended. Sinking will be commenced on the surface showing, and the shaft will probably be driven to the 200-foot level, the policy of deep mining having proved to be the best in that zone, which includes the Beaver and the Temiskaming.

Porcupine, March 24.—The last camp of the Bewick-Moreing Company in Porcupine was shut down yesterday, and the plant is for sale. Last summer the English company had three camps on the various claims, sold to them by the Timmins syndicate, but all have been closed down for some time, with the exception of No. 1, where work was suspended last week.

In the Mann mine, Gowganda, native silver, lately produced, is assaying 998 fine.

The interest being taken in the Ungava and Labrador gold fields, which are being reported as fabulously rich, has assumed significant proportions. Already some fourteen expeditions are equipping to leave for the far north this spring. One expedition is to sail from St. John's, Newfoundland, the latter part of May, reaching the gold fields about the end of June. The expedition is composed of ten men, who have had long experience in placer mining in Alaska, and are thoroughly versed in all the ramifications of this kind of mining.

BRITISH COLUMBIA.

Kaslo.—In response to a call eminating from C. F. Caldwell, of the Utica mine, and issued in the form of printed dodgers, a large number of citizens from every walk of life met in the council chamber to take the initial steps to form a mining men's club. The large number present was a surprise to many and the chamber, not affording sitting room, many stood in the hall and either listened to or took part in the discussion as it progressed. Mayor Garland occupied the chair. Mr. Caldwell set forth the object of the meeting and explained the aims of the club and told what a vast amount of good similar organizations had done for the capital of the inland empire. A committee of five with John Keen as chairman was appointed by the chair to provide ways and means to bring to fruition the plans which were submitted during the evening, and to report on Tuesday. It is proposed to secure apartments for the club in which to transact its business and entertain any who may seek its assistance in any of those matters on which it will be its peculiar function to afford help. An accurate record will be in possession of the club of every mineral claim of the country where it is, what work has been done on it and all other information which will enable a man who is interested to get possession of reliable facts connected with it. Maps will be kept, showing not only the mines and undeveloped claims, but also the trails and other means of reaching it. Mineral exhibits will also be on view. Information regarding the land, the lime, timber, fish and other sources of the country's wealth will also be classified and made available to the interested enquirer, whether he be miner, tourist or prospective settler.

Rossland, March 13.—Smelting 25,156 tons of ore during last week, the Granby smelter not only exceeded the amount of any previous week since the resumption of operations, but created a new record for a week's smelting tonnage at the reduction works. During the week 430,000 pounds of blister copper were shipped, bringing the total for the year to date up to 3,973,000 pounds.

Grand Forks, March 15.—The mines and smelters of the Boundary are making new records in the shipment of ore and in the smelting of the same. During last week 38,796 tons of ore were sent out by the shipping mines of the district. The total shipments from Boundary mines for the year to date are 323,619 tons. At the Granby smelter in this city a new record was established last week, 25,156 tons of ore being run through the eight furnaces in seven days, giving the Granby a total smelter treatment of 213,020 tons for the year to date.

The B. C. Copper Company's smelter at Greenwood treated 14,000 tons of ore during last week, bringing the total for that reduction works for the year to 106,039 tons, and giving the two Boundary smelters a combined treatment for the year of 319,059 tons.

The blister copper shipments from the Granby during the week amounted to 430,000 pounds, bringing the total copper shipments for the year so far up to 3,973,000 pounds.

GENERAL.

Fort Smith, Ark., March 20.—Mine No. 2 of the San Bois Coal Company, at McCurtain, Okla., was wrecked to-day by an explosion of gas in the ninth level, and fire and smoke have thus far prevented any effective work of rescue. One body has been brought out, and it was so badly burned that experienced miners believe there is little hope that any of the 85 men composing the day shift at the mine at the time will escape alive.

McCurtain, Okla., March 21.—Thirty-five men entombed in the San Bois mine, where an explosion occurred yesterday morning, had not been accounted for early to-night. Twenty-six men had been rescued during the day, and 55 bodies had been brought to the surface. Rescue parties still are at work to-night harbouring the faint hope that possibly more may be found alive. Fifteen men rescued to-day were found huddled in a room on the thirteenth level. They rushed there when they heard the explosion, and kept themselves alive with an air-pump. Searching parties were directed to the room by tappings on the air-pipes. The condition of two of the men is serious, but the others seem none the worse for their experience.

Venezuelan Ore Lands Venture.—According to Mr. F. G. Jones, who recently returned from a visit to the property of the Canadian Venezuelan Company, there are 150 men at work and most of the machinery necessary for the equipment of the mines is on the ground. The "Alabama" has left for Philadelphia with the first cargo of ore and from now on regular shipments will be made, although these may not reach any large amount until mid-summer or early fall. The difficulties in connection with the construction work were many, but these are being gradually overcome. The ore is of the best quality and will average 64 per cent. iron, with low phosphorous and is an ore which can be easily reduced. The quantity has been demonstrated to be amply sufficient to justify all expenditures the company is making.

COMPANY NOTES

HEDLEY GOLD MINING COMPANY.

A published summary of the annual report of the Hedley Gold Mining Company, owning and operating the Nickel Plate and Sunnyside mines, in Hedley camp, Similkameen district, British Columbia, gives the following brief information:

The company's 40-stamp mill, with cyanide plant, was operated continuously during the calendar year 1911. The quantity of ore crushed and treated was 57,815 tons, of an average value of $11.99 per ton, from which an extraction of 94 per cent. of the gold was made. A reserve of approximately 10,000 tons of broken ore in the stopes has been maintained throughout the year. The estimated total tonnage of ore in sight is now fully as large as when the property was purchased by the present owners. The development work done during the year consisted of drifting, 655 feet; sinking, 425 feet; and raising, 235 feet; total 1,315 feet. Diamond drilling totalled 3,160 feet.

The statement of accounts shows that a net profit of $318,152 was made, and that, out of this, a total of $300,000 was paid to shareholders, this being at the rate of 25 per cent. on the issued capital of $1,200,000. The balance of net undivided profit at credit of the company at the close of the year, after payment of dividends, was $200,861, and this, after charging to operating expenses all expenditures of every kind made in 1911.

NORTHERN ONTARIO EXPLORATION.

The pamphlet report of the Northern Ontario Exploration Co. as of December 31st last, has been distributed to Canadian shareholders. It shows that the company made a profit through

the purchase and sales of other shares amounting in all to £81,481. The company still held shares in other companies at a cost of £100,941, but had written down this cost to £60,941, using £40,000 of the profits for this purpose. In addition to these holdings, the company had in cash or loans £98,790 against a capital stock issue of £119,425.

LA ROSE DIVIDEND.

The directors of the La Rose Mines Company met in New York on March 20 and declared a quarterly dividend of 2½ per cent., increasing the annual rate from eight to ten per cent. Two new directors were elected to the vacancies created by recent resignations of Messrs. Earle and Greene. The new directors are Canadians of prominence, who will undoubtedly add strength to the board. They are Messrs. Edwin Hanson, of Montreal, and William Dobell, of Quebec.

The reports of the treasurer and general manager of the operating company and the report of the treasurer of the holding company for the fiscal year ending December 31st, 1911, will be submitted at the annual meeting of the company to be held at Augusta, Maine, April 29th. Advance copies of these reports will be mailed to every shareholder in the early part of April.

The report of the president, Mr. D. Lorne McGibbon, says in part: "The production of silver for the year amounted to 3,691,797 ounces, the net value of which was $1,810,470. The cost of production was 19.20 cents per ounce, and the average selling price 53.55 cents per ounce. The ore reserves on December 31st, 1911, amounted to 4,250,861 ounces, of an estimated net value of $1,643,938 and the combined surplus of the operating and holding companies amounted to $1,551,420.70 after payment of dividends of $599,450.80.

"Your directors have had under consideration for some time the disposition of this large cash surplus. Three courses have been suggested: to distribute the surplus in the form of largely increased dividends or bonuses, to invest in other mining enterprises, or to keep the surplus intact until the value of the properties now owned by the company have been fully demonstrated. After giving the matter very earnest consideration your board has come to the conclusion that the best interests of the shareholders would be served by adopting a middle course, namely, to increase the dividends to 10 per cent. per annum, payable quarterly, and, in view of the fact that the company has still a large undeveloped area to continue the vigorous policy of development which has produced such satisfactory results during the past two years, and, as opportunity presents, to acquire interests in other mining enterprises which, after thorough examination and the reports of the most competent and reliable engineers, are considered proper investments for the company's funds. This policy conservatively followed should make your company a permanent organization for the profitable development of mining properties."

Herewith is a comparison of statistics for 1910 and 1911:—

	1911.	1910.
Cost of production (cents)	19.20	19.11
Selling price (cents)	53.55	53.95
Ore reserves (ounces)	4,250,861	5,556,248
Est. net value ($)	1,643,938	2,034,686
Combined surplus ($)	1,551,420	917,728
Dividend paid ($)	599,450	475,000

TEMISKAMING DIVIDEND.

The Temiskaming Mining Company has declared a 3 per cent. distribution of profits. This is the first distribution in upwards of a year. The directors stopped dividends shortly after they bought the North Dome.

The dividend cheques will go out on April 18th, and with them will go a ballot by which shareholders may express their opinion regarding the proposed sale of the North Dome property.

The last dividend on the Temiskaming was paid October 17th. The dividend record to date is:

1908	9	$200,156.25
1909	12	300,000.00
1910	11	275,000.00
1911—April 10th	3	75,000.00
July 12th	3	75,000.00
October 17th	3	75,000.00
Totals	41	$1,009,156.25

NIPISSING QUARTERLY.

Contrary to the predictions in some quarters, the Nipissing Mines Company has declared the regular quarterly dividend of 5 per cent., and the usual quarterly extra dividend of 2½ per cent., payable April 20th. Books close March 30th and reopen April 18th.

The financial statement presented at the meeting to-day shows cash on hand, ore in transit to smelters, and at the mines amounting to $1,468,000.

The statement of the Nipissing operating companies as of March 16th shows cash in hand, ore in transit to smelters, and ore sacked at mines ready for shipment amounting to $1,468,000.

This is the best figure ever recorded in the history of the company.

COBALT LAKE.

President Pellatt's report read at the annual meeting of Cobalt Lake shareholders, showed a reduction in the capitalization of the company during the year of 625,115 shares, the outstanding capital thus being reduced from $3,929,166 to $3,304,051. Since the report was compiled it is understood there has been a further reduction of about another 100,000 shares.

The financial statement was equally satisfactory, a debit balance of $209,005 at the end of 1910 having been paid off and replaced by a credit balance of $80,847 at the end of 1911. In addition the company during the year erected a concentrator at a cost of $64,216.

Net returns from ore for 1911 were $323,793. Engineer Gordon estimates ore reserve at 2,851,180 ounces of a gross value of $1,425,590.

YUKON GOLD COMPANY.

In the calendar year 1911 the Yukon Gold Company reports an increase of $4,233 in surplus, bringing the total profit and loss surplus to $386,654. There was charged off for depreciation $434,108, an increase of $145,309. Dredge and hydraulicking produced a total of $3,116,227, which compares with 3,847,108 in 1910, a increase of $269,119. The gross hydraulic production was $444,382, which compares with $693,375 in 1910. This decrease it is explained in the report "was due to the fact that mechanical elevators were not operated during the season of 1911, as the dredges were found to do the work at much less cost." The dredge operations produced $2,671,845 gross gold, which compares with $2,150,733 in 1910, the increase being $521,112.

During the year the total yardage was increased 1,930,000 cubic yards, the company acquiring a number of creek claims by purchase or working agreement. The dredging equipment

was increased two dredges, making nine in all. The dredge operations were commenced three weeks earlier than in 1910, handling 4,159,249 cubic yards of an average value of 64.35 cents, which compares with 3,249,788 yards of an average of 66.18 cents in 1910. The cost increased from 31.09 cents a yard to 35.43 cents, the net yield being 28.92 cents, against 35.09 cents.

Hydraulicking operations disposed of 2,125,551 cubic yards, an increase of 19 per cent. Hydraulicking was handicapped by extremely low water in the latter part of the season, but despite the handicap the recovery was made with a cost of 15.5 cents a cubic yard, the lowest in the history of the company.

BEAVER DIVIDENDS.

The Beaver of Cobalt, which has just declared a 3 per cent. dividend, has this dividend record:

	P. C.	Amount.
1911—May 15	2½	$45,000
August 21	3	60,000
December 15	3	60,000
1912—April 20	3	60,000
	11½	$225,000

ORE CONCENTRATION COMPANY (1905), LIMITED.

During the month of January the Elmore vacuum plant at the mines of the Sulitelma Company, Norway, produced 720 tons of copper concentrates.

CROW'S NEST PASS COAL.

At the conclusion of the annual meeting of the Crow's Nest Pass Coal Company, Mr. Elias Rogers, president, said: "The board has decided to issue no financial statement for publication. In view of the fact that a strike among the miners was in progress most of last year, there is very little that we could say, in any event. But, while that is the fact, conditions are now on a normal basis, and we purpose reaching out for new avenues of trade to meet the restrictions placed upon the volume of our output in certain directions. We have lost business through the glut of American coal in the western market, and as a result of railways in the Western States adopting oil as a motive power, but we hope to bring our output up to its former level by seeking purchasers farther east than we have done in the past."

STATISTICS AND RETURNS

BRITISH COLUMBIA ORE SHIPMENTS.

The Consolidated Mining & Smelting Company of Canada ore receipts at the Trail smelter for the week ending March 15th, and year to date, in tons, were:—

	Week.	Year to date.
Centre Star	2,680	32,790
Le Roi	1,413	9,447
Sullivan	643	4,715
St. Eugene		401
No. 1		262
Richmond-Eureka	32	384
Molly Gibson	47	131
Other mines	1,190	10,386
Totals	6,005	58,536

Boundary District.

Following are the returns of the output of the mines and smelters of the Boundary district for the week ending March 14th, and year to date:

	Week.	Year to date.
Granby	25,112	243,003
Mother Lode	8,740	85,785
Rawhide	4,786	22,704
Jack Pot	152	3,669
Athelston	...	340
Emma	436	4,901
Other mines	220	2,633

Smelter Tonnages.

Granby	25,112	288,672
B. C. Copper Co.	13,955	119,994

The ore production for the week ending March 9th and year to date is:

Rossland.

	Week.	Year to date.
Centre Star	3,124	30,110
Le Roi	441	4,249
Le Roi No. 2	384	4,249
Bluebird	....	57
East Kootenay.		
Sullivan	459	4,072
St. Eugene	....	401
Society Girl	21	21
Ainsworth.		
Utica	....	132
No. 1	27	262
Slocan.		
Standard	163	1,788
Van Roi	125	923
Hewitt	....	25
Ottawa	....	28
Eastmount	....	30
Fidelity	....	51
Apex	....	36
Richmond-Eureka	53	352
Rambler-Cariboo	31	319
Reco	....	24
Lone Batchelor	....	31
Ruth	36	215
Middleton	....	24
Other mines	....	228
Nelson.		
Canadian King	....	54
Arlington	68	637
Nugget	....	22
Granite-Poorman	....	70
Queen	....	70
Emerald	72	670

	Week	Year to Date
Monarch (Field)	....	28
Silver Cup (Lardo)	....	86
Molly Gibson	84	84
Bonanza	....	45
Foreign.		
Knob Hill	118	861
Hope	....	20
Northport	....	34
Totals	5,282	52,531
Granby	23,479	76,051
B. C. Copper Company.		
Mother Lode	8,740	17,918
Rawhide	5,574	17,918
Emma	....	4,465
Athelstan	....	340
Jackpot	327	3,414
Unnamed	476	1,468
Totals	15,117	103,656

COBALT ORE SHIPMENTS.

Shipments for the week ending March 9 and year to date, in tons, are as follows:—

	Week.	Total.
La Rose	72.70	576.76
Coniagas	29.15	313.20
O'Brien	....	128.98
Right-of-Way	....	66.57
Chambers-Ferland	....	64.00
McKinley-Darragh	30.32	477.61
Nipissing	....	297.09
Hudson Bay	31.17	155.70
Buffalo	29.34	176.36
Crown Reserve	19.89	109.99
Cobalt Townsite	29.00	153.81
City of Cobalt	....	87.33
Trethewey	20.48	92.91
Colonial	....	115.98
Kerr Lake	65.72	103.26
Drummond	....	300.32
Temiskaming	42.44	151.29
Beaver	....	71.99
Wettlaufer	32.57	62.59
Provincial	....	22.22
Casey Cobalt	....	24.50
Totals	435.71	3,765.62

The bullion shipments for the week amounted to $30,750.69, as follows:—

	Ounces.	Value.
Nipissing	22,687.90	$13,215.69
O'Brien	10,262.00	5,747.00
Trethewey	2,024.00	1,093.00
Crown Reserve	18,390.00	10,695.00
Totals	53,363.90	$30,750.69

The following table shows the Cobalt ore shipments for the week ending March 23 and for the year to date:

	Week.	Year to date.
Beaver	.....	123,988
Buffalo	60,610	594,961
Canadian Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers - Ferland	.....	128,000
City of Cobalt	.....	174,673
Cobalt Lake	.....	206,530
Cobalt Townsite	.....	457,744
Colonial	.....	40,000
Coniagas	41,789	814,057
Crown Reserve	36,119	256,139
Drummond	.....	604,000
Hudson Bay	.....	312,412
Kerr Lake	.....	324,008
La Rose	276,198	1,552,831
Mann (Gowganda)	.....	40,000
McKinley	62,933	1,283,652
Millerette	40,000	126,000
Miller Lake-O'Brien	.....	96,500
Nipissing	206,570	1,040,710
O'Brien	.....	334,923
Provincial	.....	44,440
Right-of-Way	87,450	220,296
Temiskaming	.....	432,805
Trethewey	.....	185,823
Wettlaufer	.....	120,087
Totals	811,669	10,092,551

Bullion Shipments.

	Ounces.	Value.
Nipissing	96,906	$56,601
Buffalo	7,679	4,500
Crown Reserve	18,791	10,898
O'Brien	9,618	5,530
Totals	132,985	$77,537

The following table shows the Cobalt ore shipments for the week ending March 16, and for the year to date:—

	Week.	Year to date.
Beaver	.....	123,988
Buffalo	58,678	474,784
Buffalo	59,567	534,351
Canadian Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers - Ferland	.....	128,000
City of Cobalt	.....	174,673
Cobalt Lake	.....	206,530
Cobalt Townsite	84,000	457,744
Colonial	.....	40,000
Coniagas	.....	772,268
Crown Reserve	.....	220,020
Drummond	.....	604,000
Hudson Bay	.....	312,412
Kerr Lake	41,543	324,008
La Rose	143,119.	1,276,633
Mann (Gowganda)	40,000	40,000
McKinley	276,052	1,220,719
Millerette	.....	86,000
Miller Lake O'Brien	.....	96,500
O'Brien	77,568	334,923
Nipissing	.....	837,140
Provincial	.....	44,440
Right of Way	.....	132,846
Temiskaming	86,450	432,805
Trethewey	.....	185,823
Wettlaufer	.....	120,087
Totals	808,299	9,280,882

TORONTO MARKETS.

March 21—(Quotations from Canada Metal Co., Toronto).
Spelter, 6.85 cents per lb.
Lead, 4.25 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.95 cents per lb.
Electrolytic, 14.95 cents per lb.
Ingot brass, 7 to 12 cents per lb.

March 21—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

March 19—Connellsville coke, f.o.b. ovens).
Furnace coke, prompt, $2.10 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.
Tin, Straits, 42.40 cents.
Copper, Prime Lake, 14.70 cents.
Electrolytic copper, 14.60 cents.
Copper wire, 15.00 cents.
Lead, 4.00 cents.
Spelter, 6.90 cents.
Sheet zinc (f.o.b. smelter), 8.50 cents.
Antimony, Cookson's, 7.62½ cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $44.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
March 8	58¼	26 13/16
" 9	58¼	26 13/16
" 12	58⅝	27
" 11	58½	26 15/16
" 13	58½	26 15/16
" 14	58½	26 15/16
" 15	58⅜	26⅞
" 16	58¼	26 13/16
" 18	58⅜	26⅞
" 19	58½	26 15/16

SHARE MARKET.

(Courtesy of A. E. Bryant & Co.)

New York Curb.

	Bid	Ask
Braden	5¼	5⅜
B. C. Copper	4½	4⅝
Butte Coal	...	...
Giroux	4⅜	4½
Greene-Cananea	8⅜	8½
Inspiration	19	19⅛
Yukon Gold	3⅜	3½
Goldfields Con.	...	...
Nevada Hills	2⅜	2½
Miami	24	24½
Tonopah	7⅞	8
Ray Cons.	17⅜	17¾
Chino	26¼	26⅞
United Copper	1¼	1½

Cobalt Stocks.

	Sales. Low	High
Bailey	.02*	...
Beaver Consolidated	.47	.48
Buffalo	1.25*	...
Chambers-Ferland	....	**.15
City of Cobalt	.16½	...
Cobalt Lake	.27½	...
Coniagas	7.70*	...
Crown Reserve	3.20	...
Great Northern	.13	.13½
Gould	...	**.03
Gifford	.02*	...
Green-Meehan	.01¼	...
Hargraves	.08	.09
Kerr Lake	...	**2.87½
La Rose	4.00	...
McKinley-Darragh	1.69	1.70
Nipissing	8.40	8.50
Nova Scotia	.04½	...
Ophir	.09½	.10
Otisse	...	...
Peterson Lake	.08½	.09½
Rochester	.02⅛	.02¼
Right of Way	.07	...
Silver Leaf	.05¼	.05½
Temiskaming	.41	.41½
Trethewey	.66¼	...
Wettlaufer	.77	...

Porcupine Stocks.

	Sales. Low	High
Apex	.06½	.07
Dobie	.65	...
Crown Charter	.27	.29
Dome Extension	.55	.56
Eldorado	...	...
Foley-O'Brien	.36	...
Hollinger	12.90	13.25
Jupiter	.48½	.49½
Moneta	.17	.17½
N. Ont. Exp.	4.75	4.85
Pearl Lake	...	...
Porcupine Central	4.25	4.30
Porcupine Imperial	.06½	.07
Porcupine Northern	1.42	1.45
Porcupine Tisdale	.02¾	...
Porcupine Southern	1.75	1.78
Preston East Dome	.11¼	11½
Rea	.80	...
Standard	.20	...
Swastika	.22	...
Vipond	.48	...
United	.02¼	...
West Dome	...	**.55
Big Dome	30.00	30.30

Sundry.

	Low	High
Island Smelters	.09	.09½
Canadian Marconi	7.25	7.45

*Bid. **Offered.

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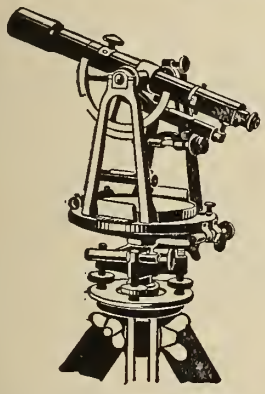

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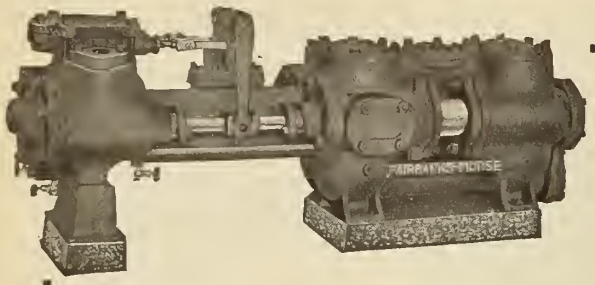

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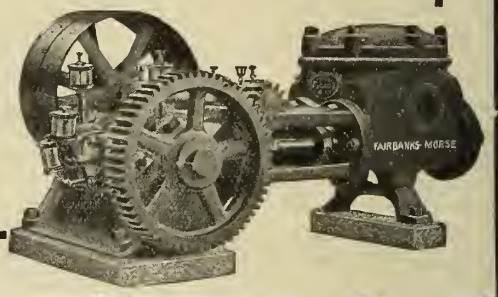

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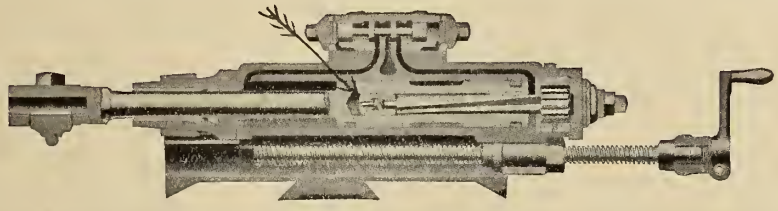

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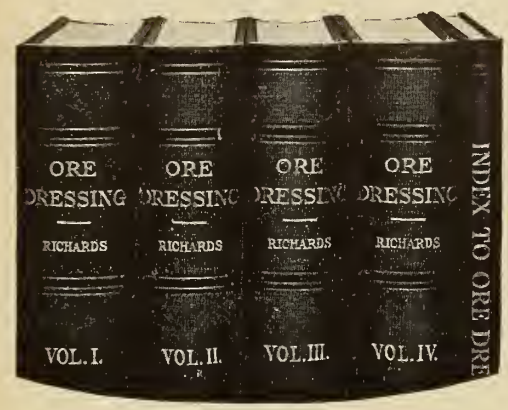

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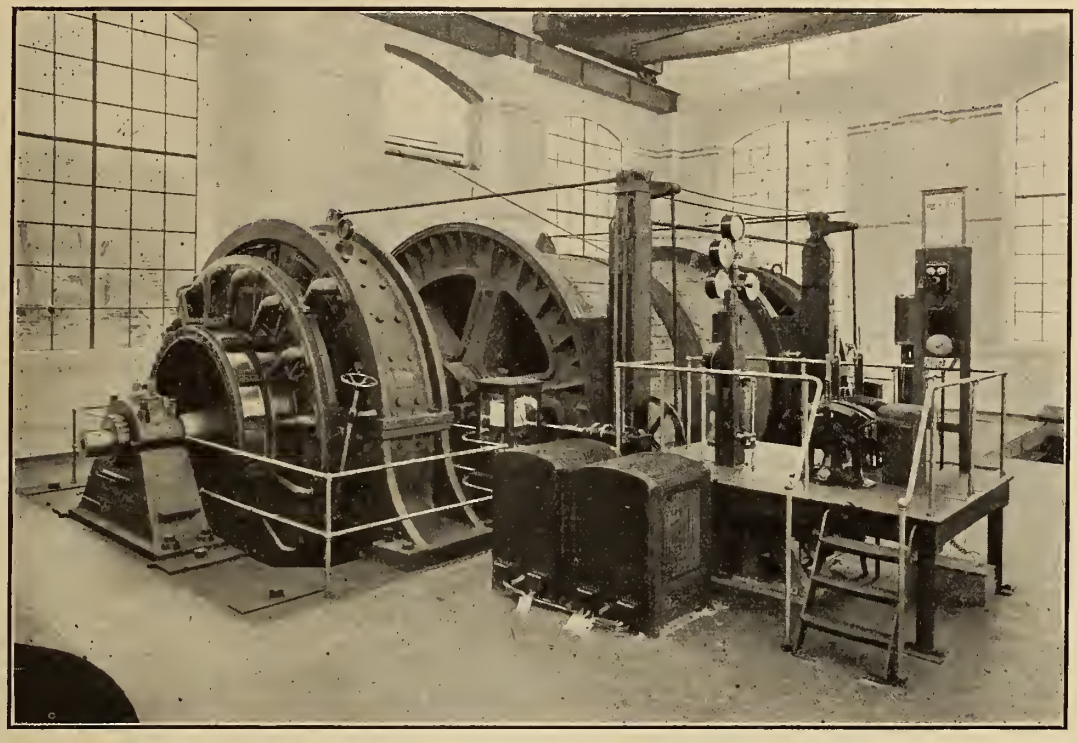

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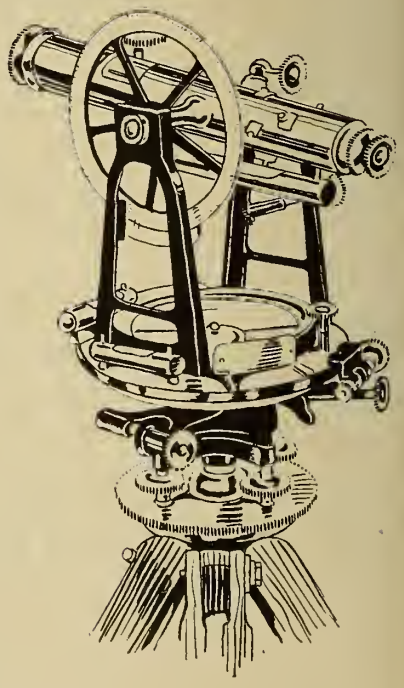
EATON'S

Universal Locating Transit



This is an ideal instrument for the City Engineer, and will answer all his requirements for grading, paving, cross-section work, sewers, etc. It is also valuable as a Railroad Transit for laying out curves, switches, etc. Its size and weight make it a particularly good instrument for Mining and Tunnel work.

S4-35. Universal Locating Transit. Achromatic terrestrial telescope 9 inches long, objective glass, 1⅛-inch aperture with dust cap, sun shade and dust protector to object slide. Improved achromatic eye-piece with spiral motion for focusing cross-hairs. Stadia wires. Clamp and tangent screw to telescope with counter spring compass needle 3⅝-inch long. The compass is provided with variation plate set by capstan head pinion. Horizontal limb 5⅛-inch graduated to half degrees and reading to one minute by two opposite double verniers placed at an angle of 30° to line sight. The graduation has two rows of figures reading in opposite directions from zero to 360°. Two spirit levels to horizontal limb graduated on the glass. Clamp and tangent screw with opposing spring, long independent centre. Four leveling screws ⅝-inch shifting centre. Weight of instrument without tripod 9½ pounds. Instrument complete in mahogany box, plumb bob, reading glass, adjusting pins, etc.. with either extension or split leg tripod.
Price **$130.00**

S4-36. Universal Locating Transit, same as above, with level to telescope. Price **$140.00**

S4-37. Universal Locating Transit., same as No. 35, with 4½-in. vertical circle reading to single minutes. Price **$157.50**

Prices on Imperial Tracing Linen

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Successors to

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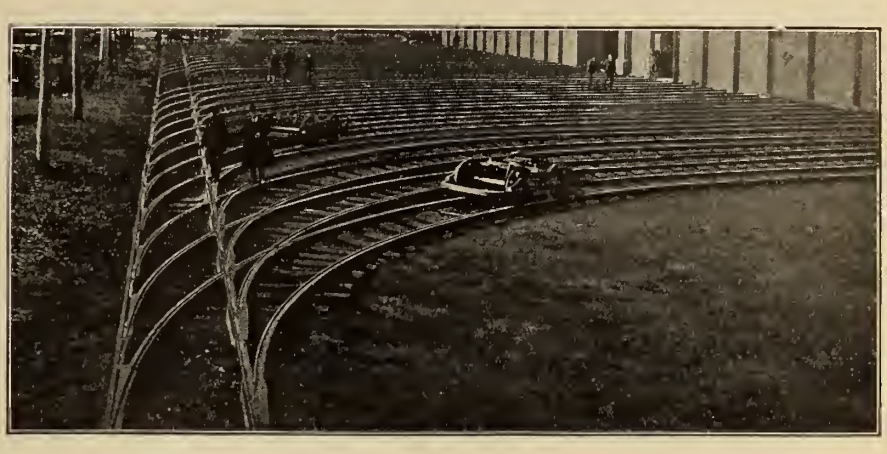

Manufacturers of Bar Steel and Angles, and the following types of Couplers, Sharon, Tower, Climax, Latrobe, Melrose, Chicago, R.E. Janney and Simplex.

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Quotations for Tee Rails, Fish Plates, etc., promptly furnished. Catalogues sent on application.

NO PAINT *Ever* Needed on this Roofing

The need of paint or gravel on a roofing is positive proof of its weakness—positive proof that the materials in the roofing would dry out, rot, rust, decay or otherwise deteriorate without such protection—positive proof that the roofing itself can't last long unless protected with a ***mineral.***

Instead of a perishable animal or vegetable material only ***temporarily*** protected with a ***thin layer of mineral*** such as paint, slag or gravel, J-M Asbestos Roofing is ***one solid mass*** of ***minerals.*** Not a particle of perishable material in it.

J-M Asbestos Roofing consists of layer-on-layer of pure Asbestos Felt securely cemented together with genuine Trinidad Lake Asphalt. Asbestos is a rock, or stone, and, of course, stone needs no coating to make it last. And the Asphalt Cement between these stone layers is the same material that has withstood the severe duties of street paving for forty years. So J-M Asbestos Roofing is an ***all-mineral*** roofing.

J-M ASBESTOS ROOFING

is the only ready roofing that never requires a single cent's worth of coating or other protection. Its first cost is its only cost. Other ready roofings are a continual trouble and expense—for the paint and gravel wash and blow off and have to be renewed every few years.

Because of this mineral or stone construction J-M Asbestos Roofing is also rust-proof, rot-proof and acid-proof. And fire that will melt iron won't ignite this roofing.

We'll sell you J-M Asbestos Roofing direct from our nearest branch if your dealer won't supply you.

GET THIS CURIOSITY FREE

We want you to see the curious Asbestos Rock which yields the long, soft, pliable yet practically indestructible fibres from which we make J-M Asbestos Roofing, Theatre Curtains, Stove Mats and hundreds of other Asbestos products. We know it will convince you better than anything we can say that a roofing made of this indestructible stone must also be practically everlasting

Simply send a postal to our nearest branch and say "Send sample of Crude Asbestos and your handsomely illustrated Catalog No. 303."

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Whether for stationary or portable service, mine pumps must operate steadily when once started, and when idle be ready for instant duty. Pumps driven by

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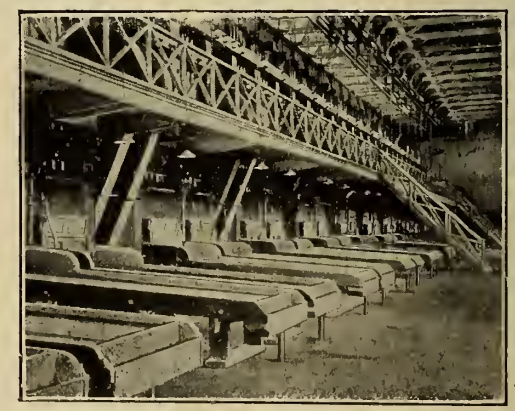

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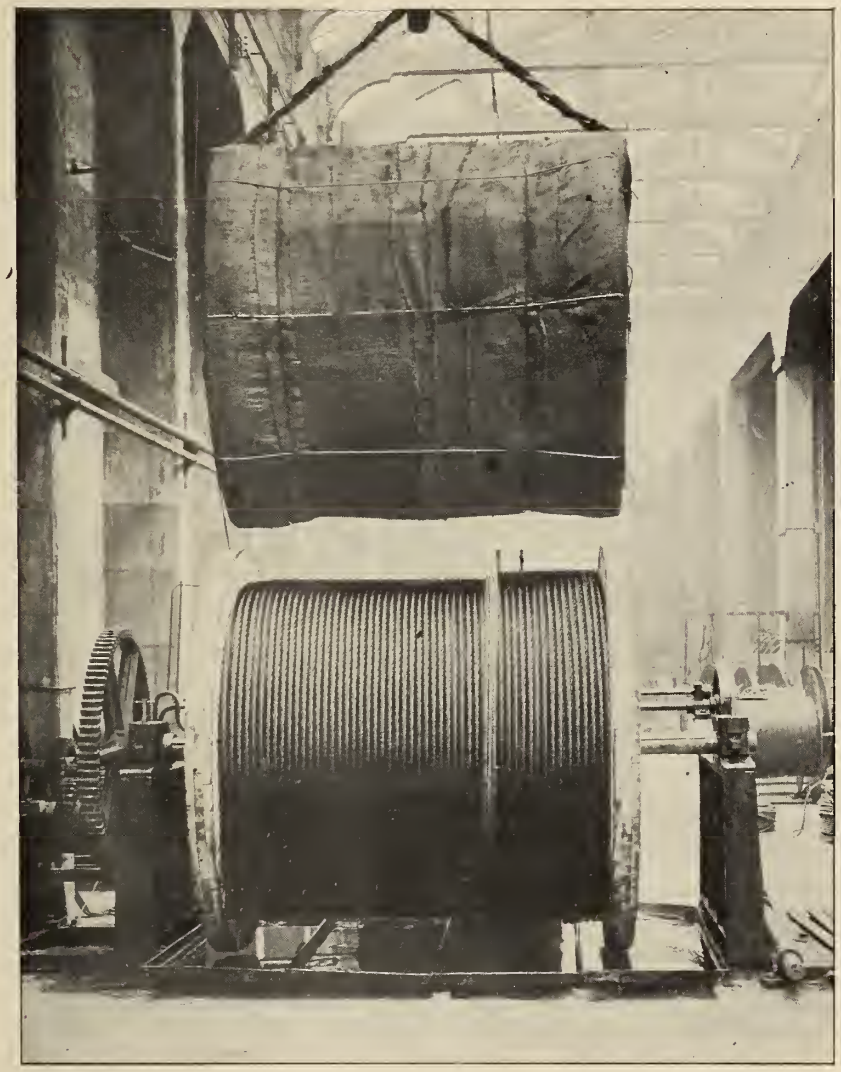

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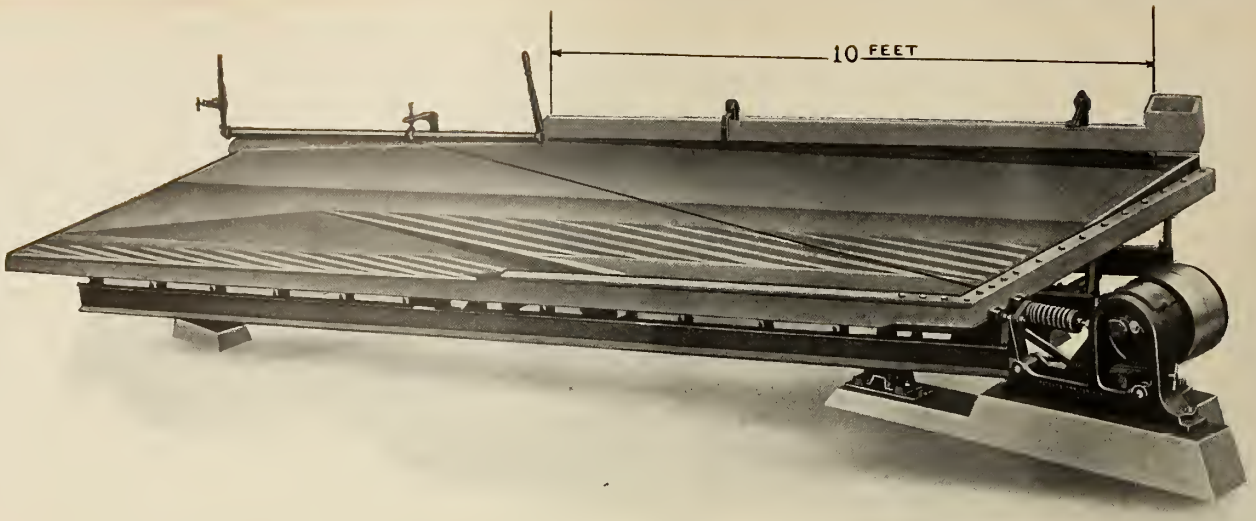

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The James Diagonal Plane Slimer Has Proven Its Superiority Over Its Competitors In The Cobalt District. This table is manufactured in New Glasgow, Nova Scotia, for the Canadian Market, and Newark, N.J. for the United States and Mexican Markets.

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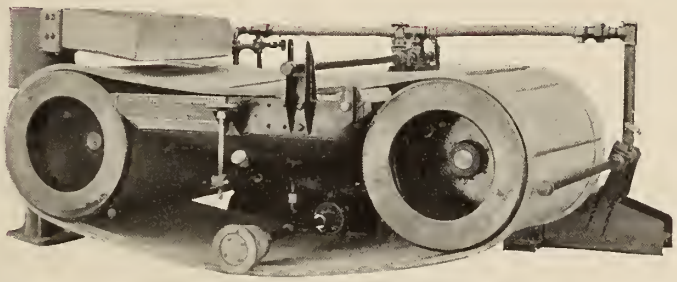
THE CANADIAN MINING JOURNAL

.. 33 TORONTO No. 8

CALLOW TRAVELLING BELT SCREENS



FOR FINE SCREENING

Simplex and Duplex Types

The following table gives the capacity and the quality of the work done by machines operating under normal conditions and these figures can be safely taken as representing only average work.

DISTRICT	Size Screened to	Per Cent. Undersize In Oversize	Capacity Tons Per 24 Hrs. Per Duplex Machine
UTAH. . .	16	5	325
UTAH. . .	20	10	250
NEVADA . .	30	14.9	150
UTAH. . .	40	11.9	150
PACHUCA . .	60	4.7	125
MONTANA . .	60	1.73	108
COEUR D'ALENE	80	5.00	115
MONTANA . .	100*	23.80	75
MONTANA . .	150*	27.00	50

*An extremely slimy ore; 75 per cent. of the feed had to pass through the screen and only 25 per cent. held on.

FINE SCREENING IS INDISPENSABLE

The field for screen sizing offers serious thought to all those who are anxious to obtain simplicity, and at the same time high efficiency, in mill practice. Screening in some one form or another is indispensable to all milling operations and the further ou would advance the more necessary it becomes to have the best machinery obtainable.

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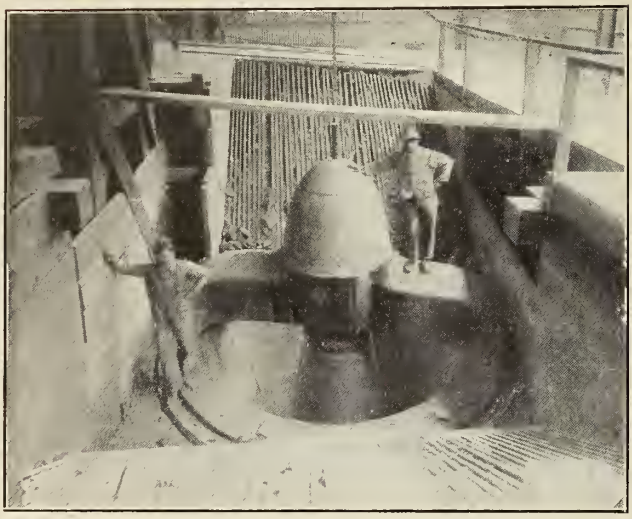
OF ALL CAPACITIES

From the humble sample grinder to the gigantic breaker shown in the illustrations.



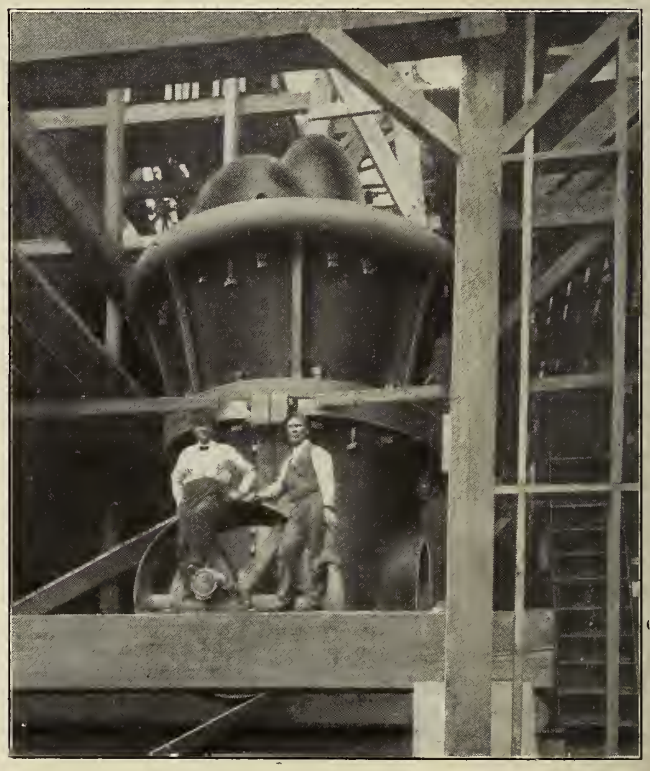
"K" No. 21

The big No. 21 "K" Crusher in Laurin & Leitch's plant, Montreal, weighs 225 tons, stands 25 feet high, and has a capacity of 1,000 tons per hour.

For full particulars of these crushers see Bulletin 1141 The sample grinder is described in Leaflet 2036.

"K" No. 21

Note the high arched spider, offering a free opening and preventing any bridging of the rock. Each opening 42 ins. x 8 ft, will receive a block 3 ft. x 5 ft. x 10 ft.



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Works: Montreal. Sales Offices: Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.

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Fastest Boring Hand Hammer Drill on the Market (in all classes of Rock or Coal)

Will Drill to a depth of 15 feet if necessary.

Has Automatic Rotation Device

Placing It Far Ahead of Its Hand Turned Competitors

The Latest "Simplex"
Only Weighs 26 Pounds.

Its air consumption is exceedingly low.

Does excellent work on any pressure from 40 pounds upwards.

Is made throughout of Dropped Stamp Steel Forgings, practically foolproof and unbreakable; therefore repairs are almost nil.

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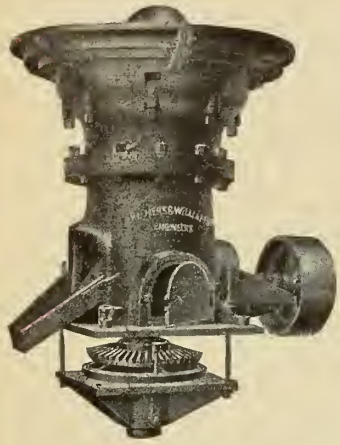
A GYRATORY CRUSHER

For Less Than You Think



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Bronze Ball Gyratory Crusher

It has been experimented on, developed and perfected by us.

It will reduce the cost of your crushed product, by reducing the amount of power consumed, by the low cost for repairs and by the increased capacity.

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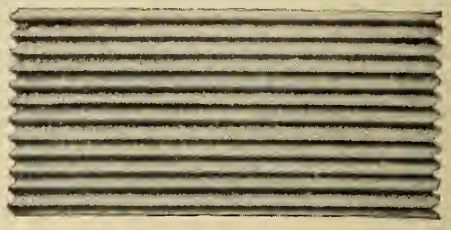

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There is a Sullivan Rock Drill exactly fitted, in capacity, character of blow, weight and mounting, to do *your* work most quickly, and at least expense for power, labor and repairs.

Sullivan Engineers have the knowledge and skill of forty years' experience to guide them in fitting drills for your requirements. Can we help you? Bulletins 666 A-B.

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A Saving in Time means lower labor cost.

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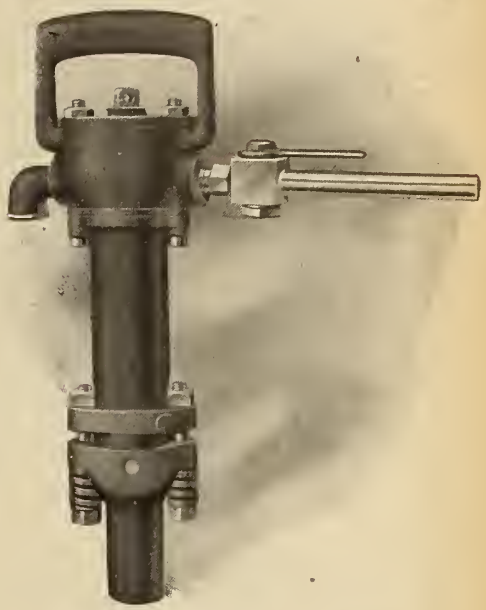

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B A-23" Hammer Drill—with Broad Tee Handle. Weight 43 pounds

The Minimum of Breakages and Repairs means low upkeep costs.

Increased Drilling Capacity per man means larger output at Lower labor costs.

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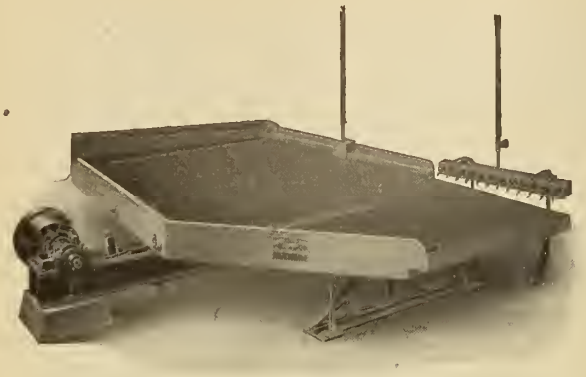

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Deister Improved No. 3 Slime Table for classified and unclassified feeds of 80 mesh and finer only.

Deister No. 4 Sand Table, better adapted to feeds from 8 to 80 mesh, classified or unclassified, than any device on the market.

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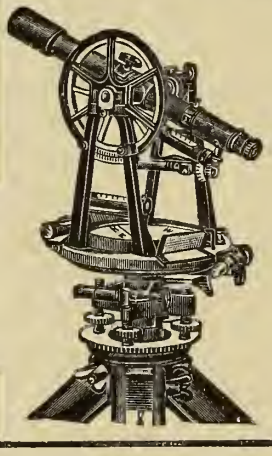

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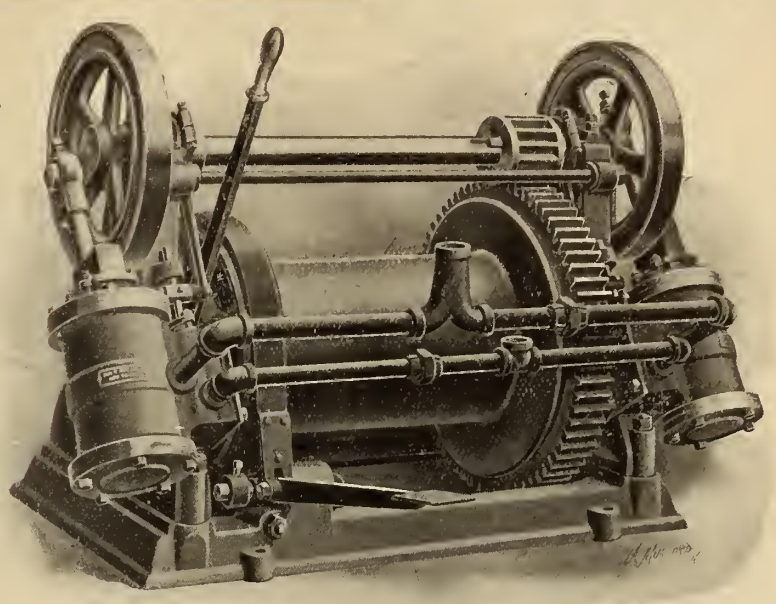

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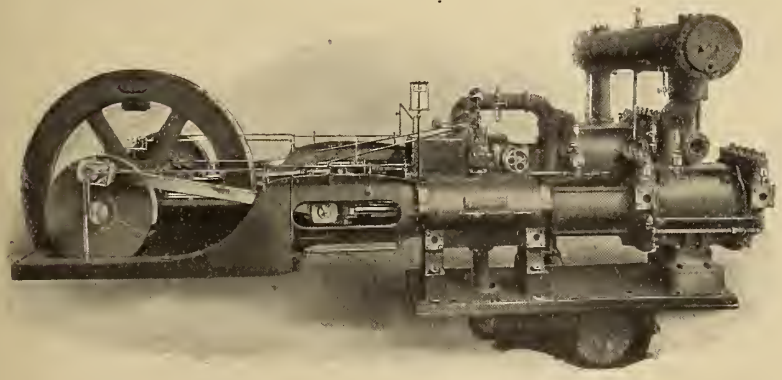
AIR COMPRESSOR
Is the Standard Compressor of the United States Navy Department



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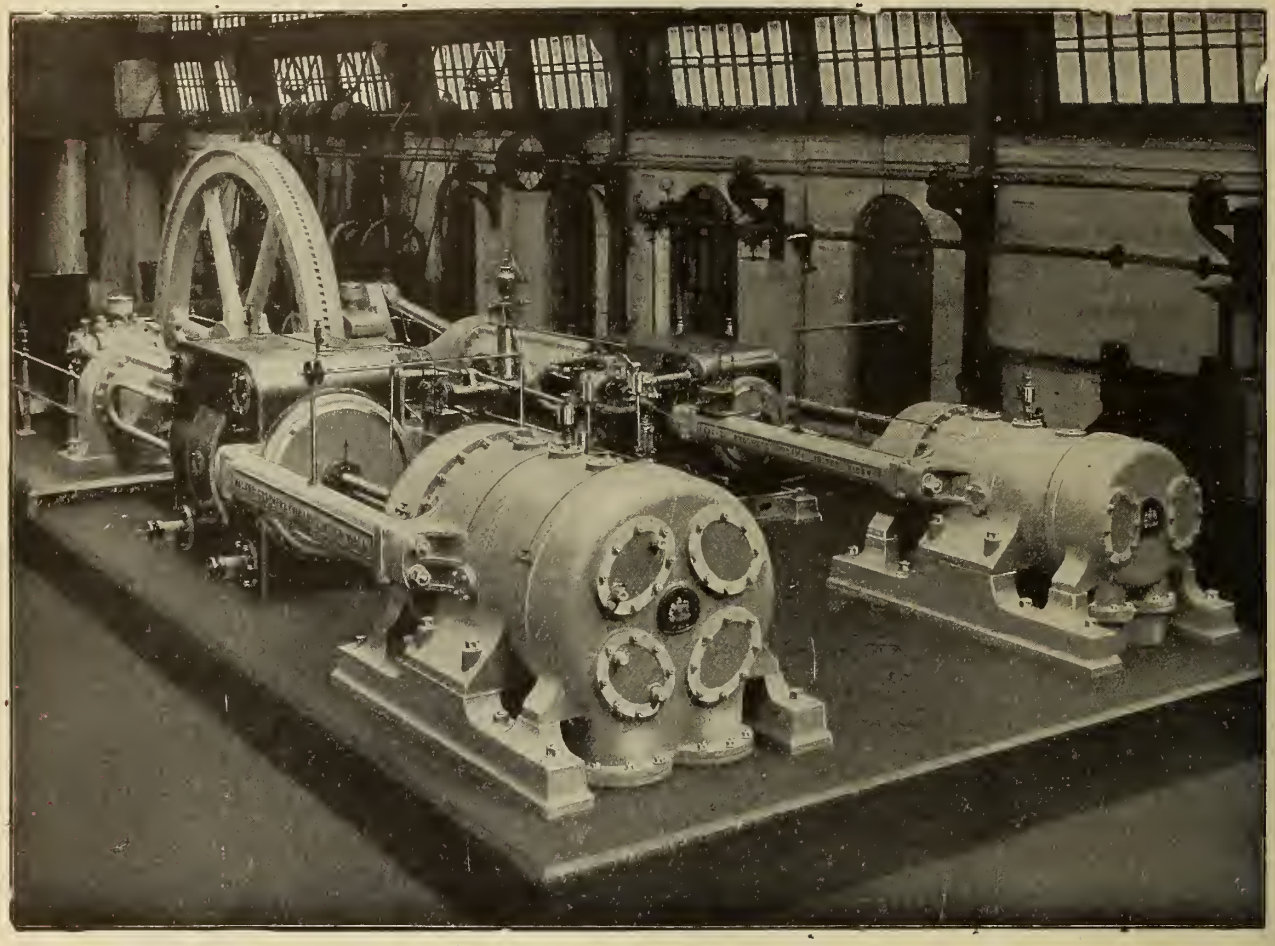

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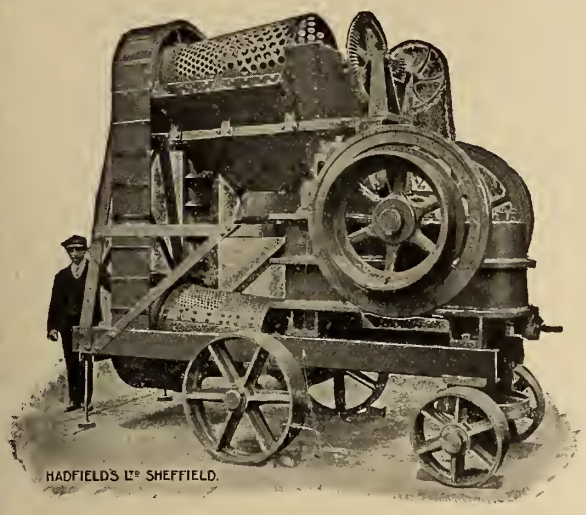

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Manufacturers of

Complete Crushing Plants

of every description,

Embodying Hadfield's Latest Improvements

Hadfield's Patent "Era" Manganese Steel

is used for all the wearing parts. This Steel is the supreme material for Tramway Track-work and parts of machinery subject to great abrasive strain.

Steel Castings OF EVERY DESCRIPTION

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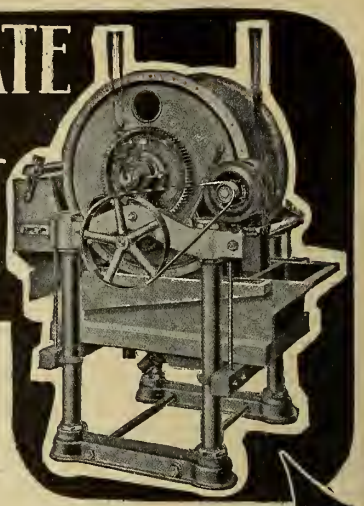

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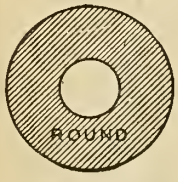

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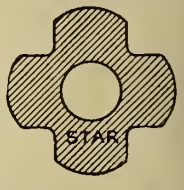

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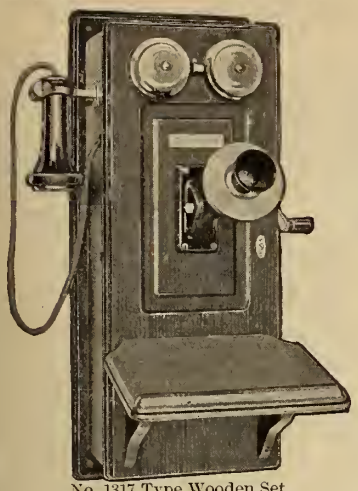

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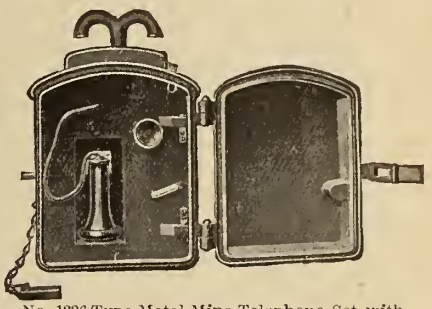

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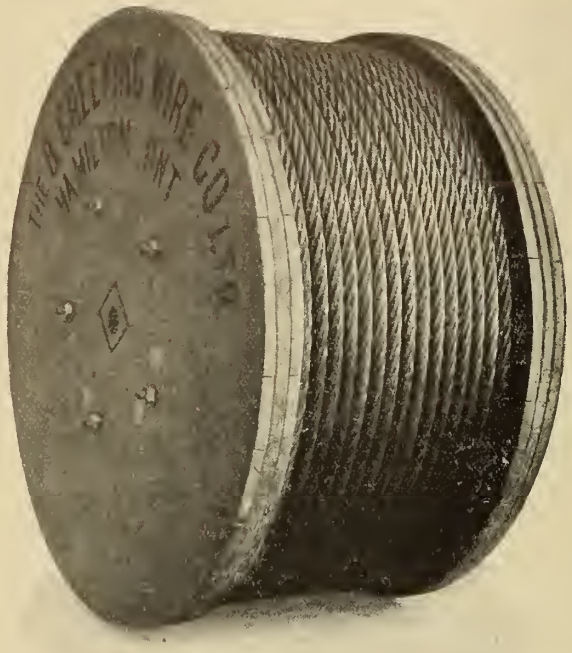

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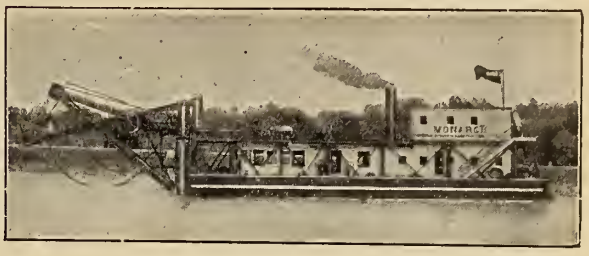

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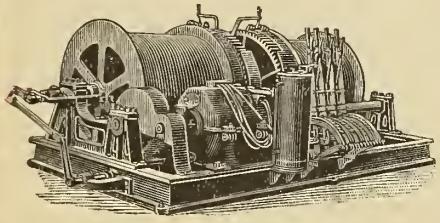

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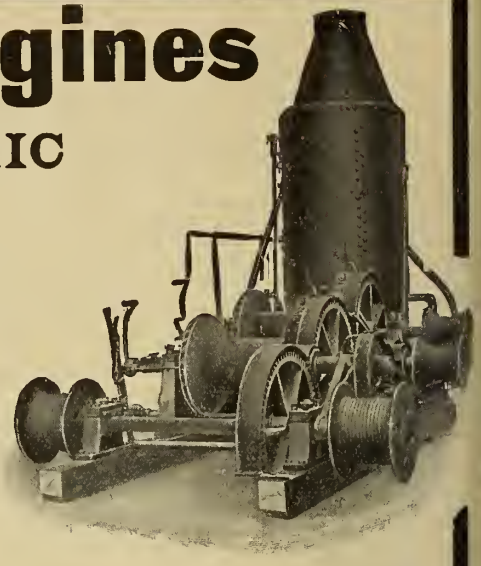

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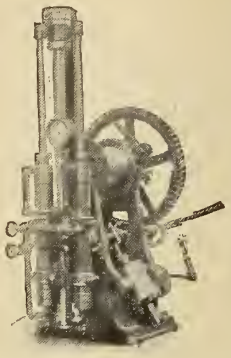

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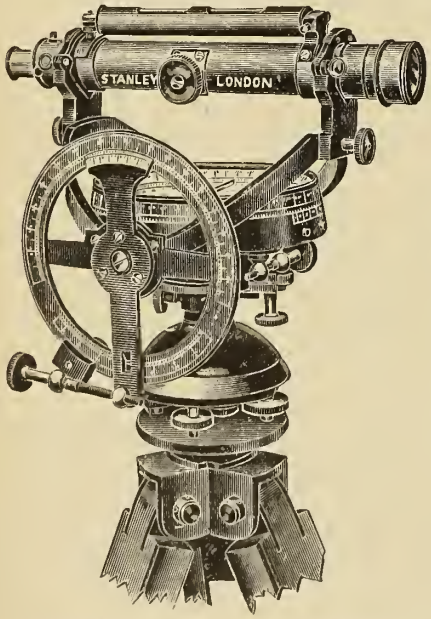

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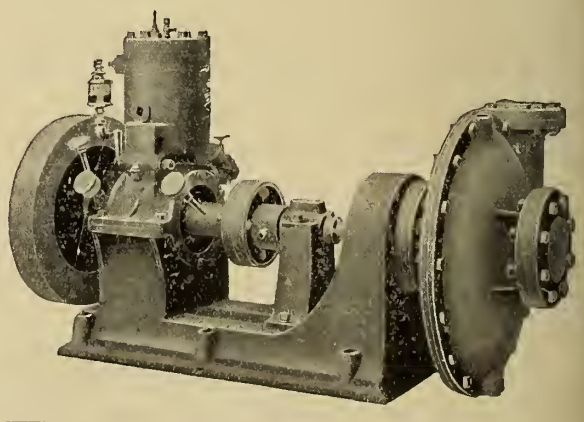

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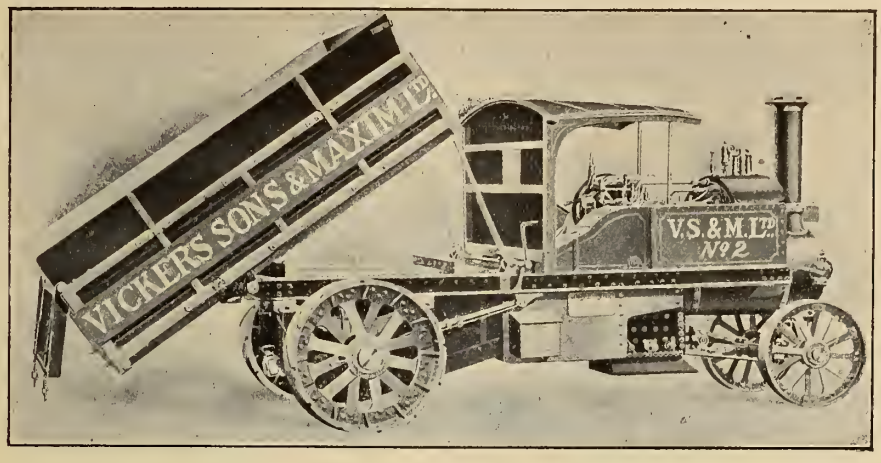

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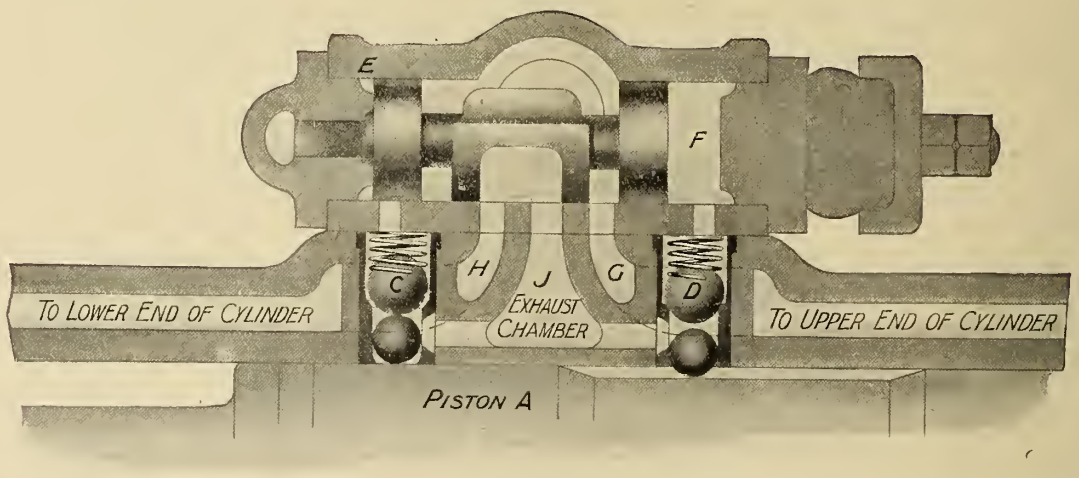

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EXTENSION OF PROVINCIAL BOUNDARIES.

In 1908 the Government of Canada proposed to extend the boundaries of the Provinces of Ontario and Manitoba by the addition to each of a part of the territory of Keewatin, and to add to Quebec the territory of Ungava. In order to have the proposal carried out it was necessary to have it accepted by the provinces concerned, but at the time Manitoba and Ontario declined. Representatives of the former province desired to have settlement of other questions notably the amount of the annual subsidy, before accepting the new territory, and Ontario felt that she was unfairly treated in the division, an extraordinary boundary line being run between her and the sister province to the west. At the session of parliament just ended, the provinces being agreeable, the proposed extension of four years ago has been enacted into law.

By the enactment Quebec receives 354,981 square miles and becomes the largest province or state in North America. Manitoba, the former "postage stamp" province, receives 178,100 square miles, and Ontario 146,400.

According to statistics published by the Department of the Interior, the three largest provinces now are Quebec, 706,834 square miles; Ontario, 407,262; and British Columbia, 357,600. These areas are, of course only approximate. The largest state in the Union is Texas, with 265,780 square miles, then follow in order of size California, with 158,360, and Montana, with 146,080.

The additions to Ontario and Quebec extend immensely their prospective mining fields, and bring under the mining laws and regulations of these provinces vast regions, which up to the present have been subject to the "order-in-council" regulations of the Dominion, there being no federal mines act.

The early construction of a railway to Hudson Bay, to which both of the great parties in the House of Commons appear to be committed, will make readily accessible to the prospector and the explorer the regions surrounding our inland sea. It also seems likely that a branch line will be built from the Transcontinental Railway to James Bay, the southern extremity of Hudson Bay. The accessible prospecting and mining territory of Canada will thus be more than doubled. Both Ontario and Quebec should reap the benefit of increased mineral output.

At present Manitoba, Saskatchewan, and Alberta, unlike British Columbia and the older provinces, do not control the natural resources—land, timber, and minerals—within their borders, these resources being

still vested in the Dominion. The same condition holds as regards Manitoba's rights in the territory recently put within her boundaries. The government now in power at Ottawa is committed, however, to the policy of giving the natural resources to these three provinces. The transfer will likely be made within a few years, and it will benefit both the mineral industry and the provinces. In Alberta, for instance, under present conditions there is the peculiar and unsatisfactory arrangement of the Dominion Government officials collecting royalty on the output of the mines, and the provincial authorities making laws and enforcing them as regards the safety of employees, and so forth. Provincial governments should be much more competent to look after the development and conservation of local natural resources than is a distant Federal Government, especially one that has under its control so vast a country as Canada.

AMENDMENTS TO THE MINING ACT OF ONTARIO.

A bill has been introduced in the Ontario Legislature by Hon. W. H. Hearst, Minister of Lands, Forests and Mines, to amend the Mining Act of Ontario. These amendments do not make any radical changes in taking up mining claims, but cover such points that have been found necessary in the administration of the Act. One of the changes is that where the first 30 days' work required to be done on a claim falls due between the 16th of November and the 15th of April it may be postponed until the expiration of that period.

Another clause provides for the granting of jackpine on a mining claim, on land not under timber license or in a forest reserve, to the owner of the mining claim without payment of government dues. Additional requirements are made for surveyors, in surveying a claim, for examining the ground to ascertain if there is any subsisting claim which conflicts with the claim being surveyed.

A number of amendments are made to the parts of the Act relating to the operation of mines, to provide for the better protection of the workmen at mines, quarries and metallurgical works. Boys under the age of 17 are not permitted to be employed underground, and boys under the age of 14 are not allowed to be employed around any mine. The rules relating to the thawing of explosives are made more rigid and prohibit the keeping of fuse, caps, electric detonators, etc., in any thawing house. A new principle has been adopted in prohibiting the use of ordinary fuse in sinking shafts or winzes. This is now made possible by the recent introduction of delay fuse which combines all the advantages of both former methods of blasting. Crushing plants are allowed to be erected in connection with the shaft house provided there is a proper auxiliary exit. New rules have been formulated for the proper safeguarding of all moving machinery and for the keeping of articles at the mines suitable for first aid to the injured.

Provisions have also been made for the removal or allaying of dust both in mills and working places underground. With the introduction of the hammer-drill the dust problem has become quite serious in some of the mines and will become more serious with the opening up of the quartz veins in the new gold camps. Old mining countries have already taken steps to mitigate this danger, and it is well that Ontario is taking up this matter before the dreaded disease phthisis has made its inroads in the ranks of the miners. Another section provides that no person under the influence of or carrying intoxicating liquor shall enter a mine or be in proximity to any working place on the surface.

Another section has been amended to make clear who are responsible for offences against the Act and to designate the amount of penalty for such offences.

Provisions are also made that, where required for or in connection with the working of a mine or quarry, the owner may acquire the right to drain or bring in water through adjoining lands and construct roads, tramways and power lines through adjoining lands on compensation fixed by the Mining Commissioner.

INSPECTION OF EXPLOSIVES.

We regret to note that the session of the Dominion Parliament has come to a close without taking up the question of the inspection of explosives. This neglect is inexcusable. Even while Parliament was in session the country was shocked to hear of a premature explosion near Fort Frances, where some 14 men while engaged on railway construction lost their lives. According to the report of the Chief Inspector of Mines for Ontario 50 per cent. of the fatalities in the mines of Ontario for 1911 were due to explosives. The report further states:

"There has never been in Canada any legislation dealing with the inspection of explosives, which is a matter coming within the jurisdiction of the Federal Government. At present anyone who has a substance that will explode may sell it, if he can get a buyer. Before the quality of the explosive is proven accidents may result. It is not only the small dealer who needs inspection, but also the large producers. In the competition for making sales and the desire for large profits, the grade of the explosive may not be kept up to the standard. Improper mixing, improper proportion of ingredients, improper packing, all tend to render the explosive unsafe and to increase the accident rate. Old explosives that have been in storage for more than a year are sometimes shipped into the less accessible camps in the winter time, and have to be used by the mining companies during the summer, as new others can be obtained. When an accident occurs now from an explosive, there is no way by which this ex-

plosive may be thoroughly tested, to ascertain wherein the fault lies."

We would urge that the Explosives Bill be prepared during the recess and brought up at the next session at the earliest possible moment. In the meantime all arrangements should be made by the Mines Branch to have the bill brought into operation at an early date after its passage.

CORRESPONDENCE

South Porcupine, April 8, 1912.

To the Editor The Canadian Mining Journal,
Toronto, Ontario.

Sir,—I notice in your issue of April 1st an article by G. W. Thomson on the diamond drill results at the Pearl Lake mine. This article, while containing many points of interest, seems to me to be open to criticism on two grounds.

First, the method of taking and calculating sludge samples will probably lead to wrong conclusions.

Second, the assumption that the holes continue to depth at the angle at which they were started is also apt to be incorrect.

The sludge is formed from the cuttings of the drill bit, and consists of material in a more or less fine state of division. During the time this material is being cut a portion of it is very finely ground and forms what is commonly known as slime. Due to the rotating of the drill rods this sliming process also takes place while the rising water is lifting the sludge to the surface. The water flowing from the top of the casing and carrying with it the ground material, passes through a box where the sludge is deposited. The finely ground sludge, in the form of slime, does not, however, have time to settle, and passes off with the water. It can readily be seen that the material which is left in the box will not give a true sample of the formation passed through. The rising current of water will also have a concentrating action on the sludge, and thus give results which are misleading.

The only way in which an accurate sludge sample can be taken, is to collect all the water which comes from the hole, thus getting the slimes as well as the sands, or to have a sample cutter which will divert a part of the stream for the sample. In either case the water should be evaporated or filtered, the residue constituting the sample.

Considering the results in Table 1, Mr. Thomson figures $8.20 over 10 feet in width, while in Table 1a he figures the sluge assays to give $8.50 over the same distance, which is apparently a good check. In order to obtain this latter result, however, he discards the assays between 50 and 375 feet as being possibly the result of a cave. Too much reliance can not, however, be placed on this assumption and it seems to me reasonable to take the assays as extending over the whole distance. Including these and following his method of calculation gives an average of $9.27 over a distance of 10 feet, which is considerably higher than the original figure. It should also be noted that the values in this hole were from a distance of only 350 feet from the surface, where the concentrating action would not be as noticeable as it would be in the deeper holes. In these the factor of error would probably be much greater.

There is also a probability of error in the assumption that the holes continued to depth in the same plane at which they were started. The character of the rock formation in Porcupine is such that one would expect decided changes in the dip of the holes. In surveying over twenty diamond drill holes of different depths and angles on the Dome property, not one was found which did not show considerable change. In one instance the end of a 1,300 foot hole started at an angle of 69 degrees, was found to be 600 feet from its supposed location. Vertical holes are, however, found to be the ones which show the greatest changes, and unless the true angle is known, estimates of the widths of veins cut by these holes are apt to be incorrect.

Yours, etc.,
G. C. BATEMAN.

PERSONAL AND GENERAL

Dr. Adams and Dr. Barlow were in Halifax recently, attending the annual meeting of the Mining Society of Nova Scotia.

Mr. Arthur P. Scott has been appointed superintendent in charge of the steel department of the Dominion Iron and Steel Co.

Mr. Jas. G. Ross, consulting mining engineer, of the Milton Hersey Co., Ltd., Montreal, is in British Columbia on professional business.

Mr. Norman H. Beaton, Denver, Col., was in Toronto recently on business.

Mr. D'Arcy Weatherbee, M.I.M.M., Mem. Can. Soc. C.E., has become a partner of the firm of Bainbridge, Seymour & Co., mining engineers, Salisbury House, London, E.C.

Mr. R. W. Brock, director of the Geological Survey of Canada, attended the recent meeting of the Mining Society of Nova Scotia in Halifax.

Mr. Jay P. Graves, vice-president and general manager of the Granby Consolidated Mining, Smelting and Power Company, will shortly return to Spokane, Washington, after having spent part of the winter in Southern California.

The Mining Magazine, published in London, England, recently mentioned the presence in that city of Mr. W. H. Trewartha-James, late general manager of the Tyee Copper Company, and Mr. Ernest Levy, manager of the mines at Rossland, B.C., of the Le Roi No. 2, Limited, and in Silverton Camp, Slocan, B.C., of the Van Roi Mining Co., Ltd.

Mr. Howard W. Dubois is making arrangements to start hydraulicking gold-bearing gravel at the Quesnelle Hydraulic Gold Mining Company's placer mine in Quesnelle division, Cariboo District, B.C., as soon as the season shall open. It was expected that the steel plate for paving part of the sluiceways would be in place by April 1st, so that no delay is looked for in connection with the work of substituting the high-carbon steel for the diorite boulders used last season.

Mr. Wm. Watson, vice-president and manager of the company owning the Mother Lode Gold Mine and 10-stamp mill at Sheep Creek, Nelson Mining Division, B.C., was expected to arrive at the mine late in March to commence preparations for the ensuing season's mining and milling work.

Colonel John Carson and Mr. Samuel W. Cohen, president and general manager, respectively, of the Crown Reserve Mining Company, Limited, Cobalt, have gone to Europe for two months on business for the company.

Mr. W. E. Duncan, consulting engineer, formerly of Merritt, B.C., has removed his office to Vancouver, where he proposes to undertake mining engineering work.

Mr. M. C. H. Little, Cobalt, was in Toronto recently. Mr. Little is leaving Cobalt for the Sudbury district.

Mr. E. B. Paul, formerly M.P.P. for Cumberland County, has been appointed a Deputy Inspector of Mines, Nova Scotia.

Mr. W. J. Loring, of Messrs. Bewick, Moreing & Co., visited California in March in connection with the development of the Plymouth Consolidated Mine.

Mr. J. B. Woodworth, mining engineer, Lyndhurst Avenue, Toronto, has recently returned from a professional visit to Arizona.

Mr. S. N. Graham, mining engineer, a graduate of the School of Mining, Kingston, who has had experience both in Mexico and Canada, is taking an office in Toronto. His temporary address is in care of the Canadian Mining Journal.

Mr. D. H. MacDougall, assistant general manager of the Dominion Coal Co., has returned from a two months' absence in England and Scotland.

Mr. J. R. McIsaac, superintendent of shipping for the Dominion Coal Co., and the Dominion Iron and Steel Co., has returned from a trip to England, after an absence of a month.

Mr. John A. Reid, mining engineer, is in Toronto, having returned from Mexico after a year's residence in the State of Jalisco.

Mr. J. B. Tyrrell is leaving in a few days for an extended visit to the mining districts of southern British Columbia.

Mr. J. E. McAllister, of New York, formerly general manager of the British Columbia Copper Company, has gone to England on a business visit.

Mr. Grant B. Schley, of New York, who is largely interested in the Britannia Mining and Smelting Company, operating an important copper mine and concentrating works in the vicinity of Howe Sound, B.C., recently visited the company's property at Britannia Beach.

Mr. Herman C. Bellinger, a well-known metallurgist, who has for years engaged in copper smelting in British Columbia, and who is now general manager of the Great Cobar, Limited, with mines and smelting works in New South Wales, Australia, has been elected president of the Australasian Institute of Mining Engineers.

Mr. David King, in bygone years editor of "The Kootenaian" newspaper, published at Kaslo, Ainsworth Mining Division, British Columbia, and long active in giving publicity to information relative to the mines and mineral resources of Slocan District, now resides at Lake Hopatcong, about 50 miles from New York.

Hugh Parke, manager of the Nipissing Mines, Cobalt, was in Toronto last month, on his way to England, whence he went via New York.

GOWGANDA DURING 1911

By G. M. Colvocoresses.

Gowganda has been plodding along in a very quiet and unobtrusive manner and, in places at least, has made a steady progress.

When the effort to secure a railroad last spring failed and Gowganda was soon after separated from the outside world by fifty miles of wagon-road, extremely uncomfortable for passengers throughout, and in many places almost impassable for either stage or freight; every one who had the good fortune to be out of the camp was only too glad to forget about it altogether until such time as it might become more easy to visit and more agreeable to inhabit.

The working mines, although few and far apart, kept quietly on with their developments, and from the Miller Lake-O'Brien and the Millerett Mines a steady production was made, while small shipments came also from the following properties: Bartlett, Boyd-Gordon, Reeves-Dobie (concentrates), Calcite Lake and Canadian Gowganda. It is an unfortunate fact that these last-named properties did not operate continuously or with much vigor throughout the entire year, but where one mine was closing down, another was nearly always starting up to take its place and the beginning of 1912 sees a production being made by the Mann Mines, the Hudson Bay, and the Powerful (all three of which should ship during 1912), while the reopening of several properties is anticipated in the near future.

Aside from producing mines a certain amount of surface prospecting and underground development has been carried on in the various sections of the camp. At East Shining Tree and Wapoose there was considerable activity during May and June, and several good surface finds were made, while two companies sunk to a depth of more than fifty feet. However, during July and August owners and prospectors completely deserted this district in order to try their fortunes at West Shining Tree.

South of Gowganda (near Smooth Water Lake), the Willing Mining Company is developing some claims

under option and promise to give this section of the camp a thorough tryout. Northwest of Gowganda the Gamey-Thompson has been driving an adit drift which is intended to intercept their exceptionally promising vein at a depth of 150 feet. At date of writing this adit has not yet arrived under the ore shoot. Near Obushkong Lake the Homestake Mining Company has been working on some very strong veins carrying copper and silver with some gold values. This company has just installed a steam and compressed air plant and promises to push the development of its property vigorously during the present year.

On the Gowganda Ridge there was very little activity until December, when the Mann Mine was reopened after several months of idleness, and almost immediately very excellent ore was produced from an open cut in the bottom of which the ore shoot has a length of close to 100 feet. This property had previously found a good ore shoot on the 90-foot level and if provided with an adequate plant it bids fair to become the third steady shipper of the camp.

In the Miller Lake district, the Northern Mining Company continued development work by hand and found some ore on the 100-foot level and also in a second shaft which was sunk to a depth of 50 feet. The Canadian Gowganda reopened in the fall after an inactivity of more than a year and made some encouraging finds on the 58-foot and 100-foot levels, besides which they produced eight tons of good ore which was shipped out in December. Here, also, it is a question of providing a plant in order to carry on the mining operations which the prospect certainly justifies. Stripping and a small amount of sinking was done on the Hart claims, and very extensive surface work was carried on by the Olcott, near Flatstone Lake, where the regular net work of veins was shown up. Several of them carry cobalt and silver in spots.

Near Calcite Lake, the principal exploration was carried on by the Ottawa-Gowganda, Flynn, Bishop, Calcite Lake and Powerful Mining Companies. On the last-named property, a narrow vein of very rich ore has recently been struck on the 150-foot level, and it is to be expected that this company will ship before spring. The Calcite Lake has already made one shipment and prospects for future production would seem fairly good, while some encouragement was met with by both the Flynn and Bishop properties, and several new finds are reported on other claims in this vicinity.

The most important development of the year was made by the Miller Lake-O'Brien mine, which has opened up its vein system (entirely in the diabase) for a length of 500 feet and to a depth of 250 feet. The ore body has a maximum length of 300 feet on the 140-foot level and promises to be equally long on the 250-foot level. This has now been driven for over 100 feet in most excellent ore, which bids fair to hold strong to a considerably greater depth. Also, on the lowest level, there are found a series of off-shoot veins, branching at nearly right angles from the main system and carrying good values into the wall for a distance of 30 or 40 feet, possibly much further. Values in this mine are still largely confined to the veins proper, which have a width of 2 inches to 5 inches, but a certain amount of milling ore is being opened up, more particularly on the lower levels. The mine is now equipped with an exceptionally complete sorting plant and also jigs and tables for concentrating the undersize from the grizzly. The O'Brien mine is producing two grades of ore, a high grade running close to 4,000 ounces per ton and a second grade averaging 1,000 ounces per ton and the shipments aggregate 15 to 20 tons per month.

Main Shaft, Plant and Camps of Miller Lake-O'Brien Mine

At the Millerett mine, the first half of the year was largely devoted to the installation of a new mining plant and the construction of a ten-stamp concentrating mill, which was put in operation the latter part of June. This mill has a capacity of from 900 to 1,000 tons per month and has been running steadily since the day it started, having produced 120 tons of concentrates, averaging considerably better than 1,000 ounces to the ton.

The underground work was largely confined to the diabase section of the property, where one vein was opened up to a depth of 200 feet and for a length of 300 feet. The ore shoots in this vein have proved erratic and unlike the ore at the O'Brien mine, the bulk of the values is generally in the wall rock. In the aggregate, a considerable tonnage of good concentrating ore has been blocked out as well as some high grade, which is hand-picked underground. The mill is being fed, both from the development work in the diabase, and from the wall rock of the conglomerate vein, which furnished the high grade ore shipped in 1910, and which has also been opened up to a depth of 200 feet.

A very interesting geological development was made while connecting up the underground workings of the Millerett mine, and this is shown by the accompanying sketch. The long drift which passes through the property on the 70-foot level, starts at the east end in Keewatin greenstone and passes almost immediately into the Huronian formation (Conglomerate, Graywacke and Arkose) the contact dipping at an angle of 75 to 80 degrees toward the west. The Huronian formation has a width of 420 feet at this point and it is again terminated by the Keewatin The contact here is somewhat irregular, but appears to dip to the east at approximately 45 degrees. It seems highly probable, therefore, that the Huronian rocks were laid down in a basin or gully of the older Keewatin and the maximum depth of the Huronian at this point may be assumed to be between 300 feet and 500 feet. The diabase sill rose from the east and the hanging wall contact with the Keewatin is very clearly defined, dipping at an angle of 30 degrees to the east. The diabase sill or flow extends on the surface for a distance of two-thirds of a mile westward from the contact, the thickness of this sill is not yet determined.

Reference to an article by Professor W. G. Miller, published in the Engineering and Mining Journal for September 30, 1911, will show a close parallel between the geological relations shown on the Millerett property and those which have been found to exist at Cobalt, but throughout the Gowganda and the Montreal River districts, all the producing veins have been found in the diabase or (in one case) in the Huronian rocks above the diabase sill. Professor Miller states that at Cobalt, 85 to 90 per cent. of the production has come from veins found in the foot wall of the diabase sill, and it is strange that up to the present time, absolutely nothing has been found in the foot walls of the several diabase intrusions which carry silver in the Gowganda district. The Huronian rocks underlying the particular sill on which the O'Brien and Millerett are located are very clearly defined less than a mile west of these properties, and the prospecting done there has so far had no good results. It would seem nevertheless that the claims thus located would merit particularly thorough development if Professor Miller's theory as deduced at Cobalt is in any measure applicable to the Gowganda district.

The total shipments from Gowganda during 1910 and 1911 amounted in round numbers to 750 tons of ore and concentrates, containing 1,000,000 ounces of silver. At the present moment, the output of the camp is approximately 50 tons per month, containing 60,000 ounces of silver. It is perhaps unfortunate for Gowganda that the steady shipments and the great part of the entire production has so far come from only two mines, operating adjoining claims, and one of them owned by an individual and the other by a close corporation. The general public, which includes the majority of the investors or possible investors, lost all interest in Gowganda after the failure of the numerous stock companies that started operations during the boom, and no one takes much interest in the doings or fortunes of the two mines mentioned above. Some of the stock companies failed because they had explored their claims and found no pay-ore, but the great majority failed because they could not sell stock fast enough to satisfy the promoters, pay for their properties and do any mining work at the same time. Several well advertised and highly capitalized companies never had any claims at all and never did a single stroke of work as far as any one can find out, and many others merely owned a working option on their claims and as they were never able to complete paying the purchase prices, these have lapsed back to their original owners.

The operators at Gowganda look forward to better working conditions in the future. Next spring it is confidently expected that a serviceable wagon road will be built from Elk Lake to Gowganda, while at the same time, the T. & N. O. Railroad will construct

No. 1 Shaft, Power Plant and Mill, Millerett Mine

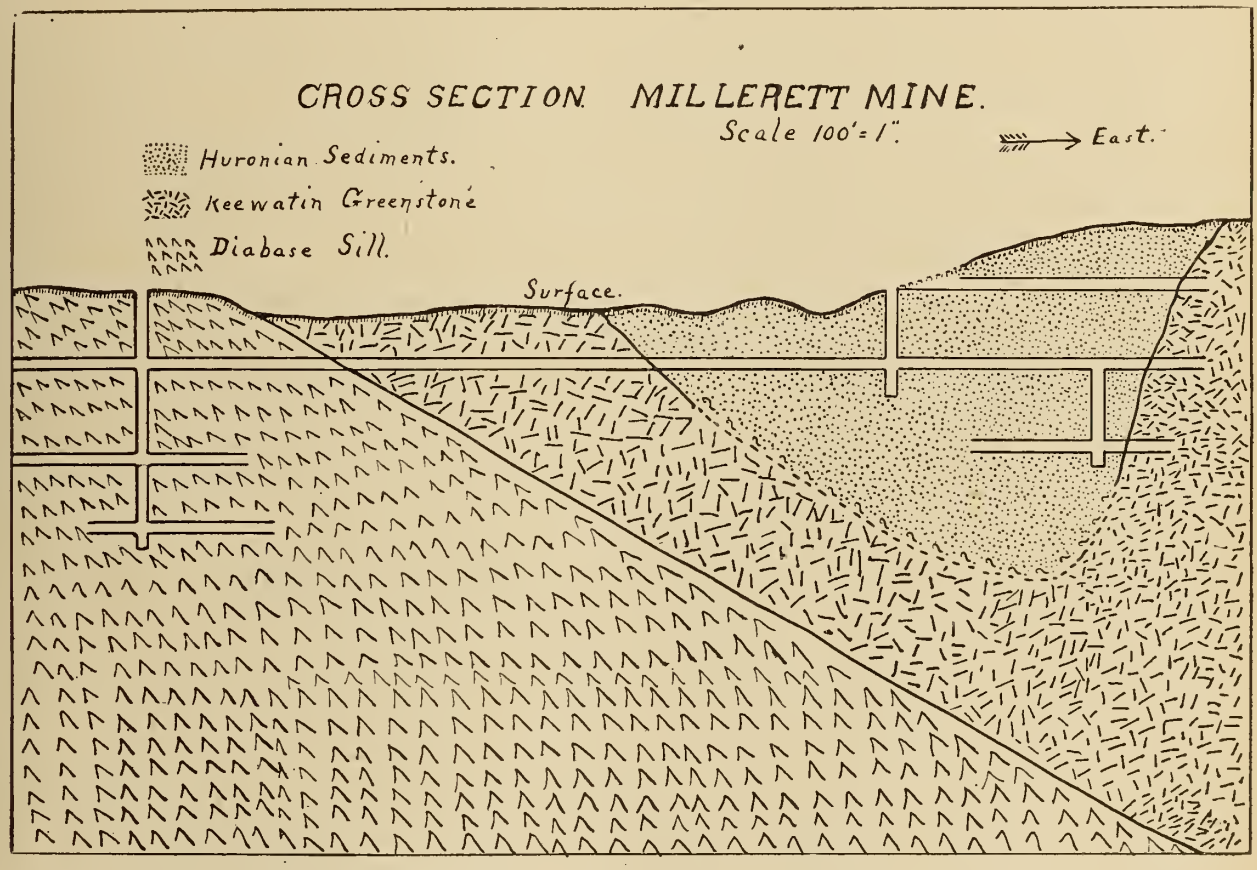
their branch to Elk Lake. After that is completed, Gowganda will be reached with ease in twenty-four hours from Toronto and the cost of freighting in and out of the camp will be cut in half. There are strong possibilities that a little later the T. & N. O. Railroad may extend further westward and pass through Gowganda, and then the conditions will be approximately the same as at Cobalt and Porcupine, and this camp will have an equal chance to stand or fall on its own merits.

As to its future prospects, nothing very definite can be said. All the way from Cobalt west beyond Shining Tree Lake, the same geological formations occur and the same geological conditions appear to repeat themselves. Three hundred square miles of this area may properly be spoken of as the Gowganda district, and after eliminating the areas covered by Laurentian rocks, by muskegs and lakes and by heavy over-burden, there still remains one hundred square miles of diabase, Huronian and Keewatin formation. On nearly every square mile there has been at least one, and sometimes several discoveries of silver, and all this area may be classed as likely prospecting ground, al-

though probably productive veins will be developed only in the intrusive diabase areas and in the portion of the Huronian and Keewatin formations immediately adjoining these intrusions. Of the 100 square miles mentioned above 4,000 acres or perhaps five square miles has been pretty thoroughly prospected and two veins have been developed, each of which has already produced more than 400,000 ounces of silver. The Millerett No. 1 vein is in conglomerate. Very little prospecting has ever been done on this formation and no other silver bearing veins have yet been found, but there is every reason to assume that some good conglomerate veins yet remain to be discovered. The Miller Lake-O'Brien vein in diabase had not a remarkable surface showing, nor did the mine look particularly promising until after a year's hard work. There were several other properties which looked better, both on the surfaee and on the 50-foot level, than the Miller Lake-O'Brien, but the others stopped at that and no one knows anything more about them, while the O'Brien kept right on and repaid the confidence of owner and manager by earning 100 per cent. working profit during 1911, with prospects of doing even better in 1912. The No. 7 vein on the Millerett also in diabase showed a length of only 12 feet of silver ore on the surfaee, while on the 150-foot level there is an almost continuous body of eonecntrating ore for a length of 250 feet and close to 100,000 ounces of silver have been taken from this vein during the past ten months. Against these faets, it must be frankly admitted that some of the very best surface showings were found to peter out altogether at a depth of 30 feet to 50 feet and some properties which have been thoroughly developed, have eertainly proved great disappointments. There does not seem to be any rule by which one ean distinguish good veins from the others, and thorough underground work alone can determine the value of each special vein, on which the surface showings are sufficiently encouraging to warrant the expense required for their exploration.

There is not at present any reason to believe that Gowganda will provide any very big or remarkably rich mine, but there are good grounds for the opinion that several profitable mines may yet be developed, similar to the two which are steadily producing at the present time. Three other mines may become profitable producers during 1912. Their development is not yet far enough advanced to make any positive statement, but their chanees look good at the present moment, and there is always the possibility of "dark horses" coming to the front.

It can at least be said that the future of Gowganda depends most of all upon the prospecting and development of the large area which is to-day absolutely idle. During 1908 and 1909, 7,000 claims were staked in the immediate vicinity of Gowganda and 2,000 more in the outlying districts, which are generally spoken of as part of Gowganda camp. The great proportion of these claims were quiekly abandoned, for the most part with little or none of the assessment work completed. About 2,500 claims still remain in good standing and on most of these, leases have been seeured, signifying that 240 days' assessment work has been recorded on the claim. Much of this work was done on contract, a good deal was slighted over and some of it entirely faked, so that very little is known as to the probable value of these properties, exeept that in several instances promising discoveries of silver were made and nothing done thereafter.



Since the discovery of the camp, approximately 100 claims (i.e., 4,000 acres) have been carefully prospected by stripping and trenching and only a small fraction of this area has been the subject of underground work and operations to-day are confined to twenty-five claims.

The area on which mineral rights are still held is therefore considerably larger than the likely prospecting area which is practically all blanketted. Prospectors who do not own claims have no incentive to try their luck at Gowganda and owners who will not prospect or develop their claims are only a detriment to this or any other district. To-day Gowganda furnishes a splendid illustration of the "Paralysis of Mining District by the Holding of Idle Claims," a common enough condition, most ably written up by Mr. E. B. Kirby in 1909.

The hope of Gowganda is that as transportation facilities and other conditions improve, the great idle area will be gradually but thoroughly explored and the result of this exploration, judging by the record of the camp to date, should be the development of several small or medium sized mines whose aggregate silver production would make a very respectable total.

DECREASE OF VALUES IN ORE SHOOTS WITH DEPTH

*By Reginald E. Hore.

The paper read by Mr. F. L. Garrison at the March meeting of the Canadian Mining Institute, being on a subject of vital importance and containing comments on a large number of well-known deposits, invites discussion. All will doubtless agree with his statement that payable deposits do not usually persist in great depth. The history of mining operations is quite clear on this point. Most of the known deposits which were rich enough near the surface to be mined profitably are at a depth of a few hundred or a few thousand feet, unprofitable, either on account of decrease in values or increase in cost of mining. In the great majority of cases it is decrease in values rather than increase in cost that results in abandonment. That there are deposits containing rich ore at depth and little or none at or near surface is quite probable; but they are not likely to be discovered. They who have explored deposits in the belief that increased values would be found at depth have good reason to conclude that such is not a common occurrence.

The term "deep mining" has a significance varying according to the district under consideration, and a general discussion of the subject presents many difficulties. I will not attempt to deal with the larger subject, but will simply add some notes on deposits in Michigan and Ontario recently studied. The copper mines here in Houghton County, Michigan, include some of the deepest mines in the world. The Porcupine and Cobalt deposits are of particular importance to Canadians. Some observations on these three districts may, therefore, be of interest to members of this Institute.

The deposits in the districts mentioned are very different; but they have some features in common. The ore in each case is the native metal—Michigan copper, Porcupine gold and Cobalt silver. All are of about the same age, being in rocks generally called Pre-Cambrian. The Michigan copper deposits are in the series of volcanic and sedimentary rocks which is known as the Keweenawan. The Cobalt silver deposits are in Keewatin, Huronian and Keweenawan rocks, and were probably also formed in Keweenawan time. The Porcupine gold deposits are in Keewatin and Huronian rocks and were probably formed during the Huronian period. All three districts are in glaciated areas and except for changes coincident with change in character of enclosing rock the ore at depth, so far as shown by development, is composed of the same minerals and is in all respects very similar to the ore found in the same deposits near the surface.

In several respects, however, the deposits differ. The Michigan copper deposits are in bedded rocks. The richest ore is a coarse conglomerate averaging 15 feet in thickness. All the others being worked are the amygdaloidal upper parts of bedded volcanic rocks. The copper in both types of rock is partially in the form of a filling and partially as a replacement of rock constituents. The Cobalt silver deposits are chiefly in the form of very small vertical veins of rich ore on either side of which there is some silver in minor fractures in the wall rock. The enclosing rocks are seldom schistose and comparatively few of the fissures which have been filled with ore show signs of extensive differential movements. The rocks have been much fractured, but the individual fractures are not extensive. The Porcupine gold quartz deposits are in rocks that have been much crushed and altered. The region has evidently been very extensively fissured and some of the individual fissures were long and probably deep.

The deposits in the three districts are therefore of very different types. The origin of the spaces which were filled with ore was entirely different, and it is probable that there was little in common between the ways in which the ore was deposited in the three districts. The Michigan copper deposits persist to depths of thousands of feet. The Cobalt silver ore shoots are commonly but a few hundred feet deep. The Porcupine gold deposits have not yet been extensively developed. From their character it is likely that the gold mines will be deeper than the silver mines, but the extent of individual ore shoots is yet unknown.

†Michigan Copper Mines.

There are at present in Michigan 19 mines, which are producing large quantities of copper, and a few others which are producing small quantities. Many of the mines are over 2,000 feet deep on the inclination of the lodes, which varies from 37 to 73 degrees, and three mines have workings which are over one mile down on the dip. The deep mines are the Tamarack and the Calumet & Hecla, which are on the Calumet conglomerate lode, and the Quincy, which is on the Pewabic amygdaloid lode. The Calumet lode dips at 38 degrees near surface and at 37 degrees 30

*Mining Geologist, Houghton, Mich.
†A description of these mines will be found in volume on Mineral Resources of Michigan, 1812, Michigan Geological Survey.

minutes at depth. The Pewabic lode dips at 54 degrees at surface and flattens more or less gradually to 38 degrees at a depth of one mile.

The Tamarack mine has five vertical shafts which have respectively the following depths: 3,409 feet, 4,355 feet, 5,253 feet, 4,450 feet, and 5,308.5 feet. No. 5 is the deepest vertical shaft in the world. From No. 3 shaft workings a winze started at a vertical depth of 5,223.5 feet has a further depth of 335 feet on the dip of the lode. The bottom of this winze is therefore 5,430 feet vertically from surface. The ore in the deep workings averages about 19 pounds copper per ton. To mine this without making new openings costs about 12 cents per pound. To continue openings further brings the cost up to 15 cents. At present the price of copper is 14 5/8 cents, and whether the mine will be in the future worked to greater depth depends upon conditions which cannot be safely predicted. The severe pressure at great depth results in crushing, and adds materially to the cost of mining. The ore at the lower levels is below the average grade, and we have here therefore a deposit which has decreased in value with depth, but has been profitably worked to a vertical depth of one mile, and which at greater depth contains ore which if near the surface could be profitably mined. Further development work has been discontinued because the openings recently made do not point to an improvement in values. Whether or not there is richer ore at still greater depth will remain unknown, unless it is found that the low grade ore can be profitably mined.

The Calumet and Hecla Mining Company is mining the Calumet conglomerate lode from nine shafts, one vertical, seven following down on the dip of the lode from surface, and one inclined shaft or winze starting below the 57th and running 1,588 feet parallel to the lode, but at an inclination of only 22 degrees. The vertical shaft is 4,900 feet deep. The seven incline shafts have respectively the following depths—6,155 feet, 7,995 feet, 6,186 feet, 7,465 feet, 7,570 feet, 6,102 feet and 7,529 feet measured on the incline starting at 38 degrees and changing to 37 degrees 30 minutes. Some of these shafts are being deepened. The others have been bottomed at the boundary between this property and the Tamarack. The ore now being mined is lower grade than that found nearer the surface The company did not in the early days publish statements of the values contained in the ore mined. It was much richer than that now being taken from the deep workings. In 1900 the ore mined averaged 3 per cent. copper, but the workings below the 57th level in the northern part of the mine yielded ore of much lower grade. The average yield for ore mined in 1910 was 30.12 pounds per ton. The decrease has not been by any means a gradual one, and there are parts of the mine where payable ore was not encountered until great depth was reached. On the whole the Calumet lode shows a falling off in values with depth; but is still being very profitably worked at a depth of over 7,000 feet on the dip of the lode. Actual figures showing values in all parts of the mine are not available; but according to Dr. A. C. Lane and others the lode was at its best at a depth of 2,000 to 3,000 feet. We have, therefore, an increase with depth for 2,000 feet, maximum values to 3,000 feet, and then decline to greater depth. Neither increase nor decrease were very regular, and the figures given there are only approximates.

The Quincy is mining the Pewabic lodes by four inclined shafts, three of which, No. 2, No. 6 and No. 7, are over one mile deep on the dip of the lode. No. 8 is nearly one mile deep. Excluding virgin territory north of No. 8 shaft the bottom of the mine has reached an average depth on the dip of the lode of about 5,200 feet. If the copper contents continue to be as good as at the deepest present workings, the lode will, without doubt, be profitably mined to much greater depth. The ore now being mined yields 16 pounds per ton. In some of the workings near surface there was mined in the early days ore which contained a much higher percentage of copper. As in the case of the Calumet lode the general statement can be made that there has been a decrease in values with depth. The ore being mined at a depth of one mile is not as rich as the ore which was taken from the upper workings. It must not be inferred, however, that the decrease is a gradual one. There are levels at which the ore is not as good as that at the deepest workings, and there are splendid ore bodies at a depth of 4,000 to 6,000 feet, which in the upper levels show comparatively low values.

Instead of a single lode there is, at the Quincy mine a zone about 300 feet thick, in which there are several lodes. These vary considerably in different parts of the mine. For the most part they run parallel to one another and are separated by trap. In places they come together. There is commonly one lode that is better than the others and is known as the "main" lode. As the workings are continued this "main" lode becomes lower in values than one of the "east" or "west" lodes. What is known as the "main" lode in workings from one shaft is not called the main lode in another part of the mine. In places there are four parallel lodes being worked at once.

At the Quincy, therefore, the conditions are such that there is a greater chance than usual of finding ore shoots which are rich at depth; but not at surface high enough in values to tempt investigation. In mining one lode cross-cuts are frequently made and diamond drill holes bored into foot and hanging walls. This practice has resulted in the discovery of numerous ore shoots at great depth. Such lodes, richer at depth than at the surface might forever have remained undiscovered if they had not been situated within a short distance of a lode which was rich enough near surface to be profitably mined.

Cobalt Silver Mines.

At Cobalt there are no very deep mines. The ore shoots which outcrop at surface have failed suddenly in values at a depth of a few hundred feet. Similar ore shoots have been found which do not outcrop, and it is probable that others will be found by underground exploration. The ore is very rich and the veins are remarkably numerous. On either side of the rich veins there is usually a few feet of profitable low grade ore. Naturally, therefore, there is very good reason to expect that lateral exploration will result in the discovery of very large quantities of ore. Whether or not there are ore shoots at great depth is unknown and not likely to be determined in the near future. It will take many years to develop and mine the ore that is within 500 feet of the surface. Very important changes take place in the ore shoots before this depth is reached, and it is to these changes that the following notes refer.

At Cobalt it has been found that the silver veins show remarkable dependence on the rock which encloses them. Most of the ore shoots are in Huronian sediments and do not continue without marked change of values down into the underlying Keewatin. Many ore shoots lose their values suddenly before the contact is reached. Along the so-called "west ridge," where are located the Hudson Bay, Trethewey, Buffalo, Coniagas and some of the Nipissing workings, the ore that has been mined has come almost entirely from shoots near the base of the Huronian sediments. The deposits showed rich ore outcropping where the conglomerate is thin just east of outcrops of Keewatin rocks. Exploration by vertical shafts proved that the ore shoots do not usually continue down into the Keewatin rocks; but that they pitch to the east parallel to the contact between the Huronian and Keewatin. In the Huronian series itself the shoots often lose values suddenly with depth; but quite similar variation in silver content is found laterally. The ore from the deeper workings is quite like that at the outcrops, and there is little to suggest that the ore shoots are genetically related to the present surface. There has been apparently no important migration of silver since the surface was swept clean of decomposed rock by the glaciers. It is not unlikely, therefore, that where the Huronian series is thick there are silver veins similar to those which outcrop where the conglomerate is thin. It is probable that the Huronian is in places 500 feet thick and rich silver viens are not unlikely to be found in the lower half of the sediments where this thickness is found. It seems that the Keewatin rocks have determined the localization of the ore shoots in the overlying sediments, and the ore thus far mined has practically all come from within 200 feet of the Keewatin. It is not to be concluded from the above that ore is being mined only from the Huronian. Ore is also being mined from the Keewatin, and it is quite probable that many more deposits will be found in these older rocks. The point which I wish to emphasize is that the ore shoots in the Huronian are mostly within 200 feet of the Keewatin and pitch with the contact and generally fail at or near the contact.

Of deposits in the diabase it is characteristic that the ores are similar to one another and differ from those in the other rocks by containing a comparatively small amount of the arsenides of nickel and cobalt. The deep parts of an ore shoot as in the other rocks are of quite similar character to the surface ore. The values fail suddenly vertically and laterally. There is no apparent dependence on the present surface. Some veins have been followed down from Keewatin rocks into the Keweenawan diabase. At the Nova Scotia the character of the ore was different in the the two formations. In the Keewatin greenstones it contained much smaltite, while in the underlying diabase there was little. The ore shoots in the diabase at this mine are richer; but have not been found to hold with depth.

At the Temiskaming mine below the fifth level Keweenawan diabase has been encountered, and two of the veins which were productive in the Keewatin have failed at the contact. The diabase below the workings on the other productive veins has not yet been explored. The workings at the Temiskaming mine are the deepest at Cobalt, and it is interesting to note that the ore shoots in the deepest workings in the Keewatin are at least as rich as those near the surface.

There are cases where rich veins in Keewatin rocks have failed suddenly at a depth of a very few feet, and most of them have failed at less than 200 feet. The changes vertically are, however, not more marked than the changes laterally. One rich vein in Keweenawan diabase at the Kerr Lake mine, described by S. F. Emmons† failed very suddenly at a depth of 350 feet and further exploration did not show any change in formation. Another rich vein in diabase failed when the contact with the Keewatin was reached.

While there are some exceptions it can be stated as characteristic of the silver veins at Cobalt that the decrease in values with depth is coincident with change of formation. For ore shoots in any one formation it may be stated that values change very markedly vertically; but just as markedly laterally. The changes in value with depth have apparently not been dependent in any way on the present topography. Some shoots fail a few feet from surface and some continue for 100 or 200 feet. Many ore shoots do not outcrop.

Porcupine Gold Mines.

The deposits at Porcupine have not yet been developed to any considerable depth; but it may be of interest to call attention to some of the characteristics of the deposits which have a bearing on the question. The veins exposed have all been glaciated and there has been apparently practically no alteration since. The ore looks remarkably fresh at the surface and samples taken a few inches from the surface show very little more alteration than those from a depth of 200 feet. There is no good reason to believe that the character of the ore has been determined by the present topography, and glaciation was quite as likely to leave exposed a poor part of an ore shoot as a rich part.

At the Hollinger Mine a remarkable deposit has been partially developed, and the results of sampling reported* by Mr. P. A. Robbins. At the surface for 900 feet it averages 9.4 feet wide with an average gold content of $32.96 per ton. At the 100 foot level it shows a continuous ore body for 1,000 feet, averaging 8 feet wide with an average gold content of $31.54 per ton. At the 200 feet level for the 350 feet of drifting done the ore body averaged 9.3 wide and contains $49.30 gold per ton.

At the Vipond mine there are two rich veins about 100 feet apart. According to H. P. Davis** one of these veins showing 4 to 6 feet of quartz, mineralized schist and ferrodolomite averages at surface $30 per ton for a length of 600 feet. At the 100-foot level the values for a stoping width of 42 inches and a length of 320 feet average $23.10 per ton.

At the Rea mine, the main vein stripped for 205 feet, shows, according to Mr. Rea,*** an average at surface of $23.05 for a thickness of 6 feet. At the 200-foot level for a length of 200 feet the shoot averages $18 per ton. Where cut at the 300-foot level the vein is 38 feet wide and the values low. The ore shoot has therefore at the shaft a vertical extent of less than 300 feet. Whether it extends deeper in other parts of the vein, and whether there are other ore shoots in the vein are not yet known. It is not unreasonable to expect that similar ore will be developed at greater depth.

There are at Porcupine no deep mines; but development has shown that the rich ore is not a superficial phenomenon. The gold in all the deposits is in

†Mining and Scientific Press March 18 th, 1911
*Annual Report Hollinger Gole Minie, 1910
**Canadian Mininf Journal, Jan. 1st, 1912, pp. 16-8.
***Canacian Mining Journal, Nov. 1st, 1911, pp. 697-699.

the form of the native metal, partially in coarse grains, but chiefly in very minute particles intimately associated with pyrite. There is at depths of 100 and 200 feet ore that is quite as rich and of the same character. The information concerning values at greater depth is slight and for the most part confined to drill cores. These give no very reliable estimate of the extent of ore bodies; but they show that the ore at depth is of quite similar character to that near the surface. At one property it has been found by drilling across the strike of the ore shoots that they are in places at least as rich at a depth of several hundred feet as at the surface. How large the several shoots may be, and what their average values, can only be guessed at. It would be remarkable if glacial action had exposed the best part of each ore shoot. In some mines it has already been found that it did not. There is no safe ground for assuming that any one ore shoot will persist to great depth. It is quite possible that the values will be found to fail within a few feet of the present workings, for such is not an uncommon occurrence. It is quite as likely, however, that the shoots have a vertical dimension as great as the lateral, for the distribution of values shows nothing to indicate the contrary. Where it is found that there are no exceptional features such as faulting, etc., it is reasonable to count on a depth equal to one-half the lateral dimension.

OPENING OF THE DOME MINE, PORCUPINE

(By Our Special Correspondent.)

To commemorate the starting up of the Dome mill a demonstration was organized in the Porcupine camp. On Friday night a special train of Pullmans arrived in South Porcupine, consisting of the T. & N. O. Commission, the Dome directors, newspapermen, and a very large representation of mining men and brokers from Toronto, in addition to operators from all over Northern Ontario.

On Saturday morning a special train ran out to the Dome mine, where mill and mine were thrown open to the public. The forty stamps in the mill were dropping all the time the visitors were passing through the mill and everything but the cyanide end of the plant was in operation. As there has been an absolute edict against allowing anyone underground at the Dome before this, the privilege of walking through the drifts was much appreciated.

A raise has been put through to the surface from the 45-foot level, and ore is trammed to the rock house where it is crushed, thence it passes in a conveyor belt to the head of the mill. Underground there are now eleven raises to the surface, and from the shoots ore can be taken out into the cars at any time. A block of ground, 200 by 600 feet, has been divided into 100 feet sections, and the whole of this will be open-cut, yielding ore enough to supply the mill for at least two years, while further ore is blocked out at lower levels. There are to-day 1,800 feet of drifts and cross-cuts at the 45-foot level alone.

After the inspection at the Dome, the visitors drove out to the Hollinger, the McIntyre, and the Vipond, where all plants and mines were thrown wide open for inspection. It was very opportune for the good success of the celebration that Mr. Albert Freeman, president of the McIntyre mill, brought the first gold brick from the camp to South Porcupine the day before, so that the first fruits of the camp could be seen and felt. It weighed 160 ounces of gold, the result of 174 hours run at the McIntyre ten-stamp mill. At night several speeches of importance were made at the banquet in the Majestic Theatre.

Mr. Ambrose Monell, president of the International Nickel and of the Dome Mines, gave a brief sketch of the conditions at the Dome up to the present time. He told how the option came to be taken up and of the heavy expenses in transportation which caused them to spend $80,000 for teaming from the steel alone.

He continued: "In July, 1911, we had done a certain amount of underground work and practically completed a mill, when the awful cyclone of fire swept the country and left not a vestige of any work above ground. I arrived here two days afterwards, and I may say to you that the insurance companies willingly co-operated in the quick adjustment of accounts, thus enabling us to proceed rapidly with reconstruction. Plans for the new brick buildings, hospital, storehouse, power house, crusher, etc., were out, and orders for material placed within ten days. The mill was erected under the supervision and untiring co-operation of a staff, which for team play I have never seen surpassed. We had the advantage of the presence of Mr. Merrill, the president of the Merrill Metallurgical Company; of Mr. Mein, the well-known mining engineer, with his wide and varied experience in South Africa and in America; of Mr. Meek, our general superintendent, and of Mr. Hanson, in charge of the erection of the plant. Even with the observation which you have had to-day you will perhaps not appreciate all that was necessary to do in such a short time, in order to make the conditions of life not only bearable, but comfortable for such an isolated and self-contained community. Much, of course, remains to be done in the way of underground development, before any real judgment can be formed as to the ultimate extent and character of the deposit. It would be idle for me to say more than that we have great belief in the future of the property, which will not be run with one eye on the hoist, and the other on stock ticker.

"Now, as to the outlook of the camp, and for the belief of myself and associates in the mineral future of this country; there is no reason to believe that the ore bodies are contained in only a few properties. The development which has already taken place puts the camp farther ahead, in the same space of time, in the way of probabilities for its future than any other gold camp I have ever known. Do not be too hopeful or despondent. Such a gold camp requires time for careful development, requires a large expenditure of money for the development, and after the development a knowledge that you have orebodies sufficient to justify the erection of a mill. It requires a large expenditure of money for the installation of individual mills, or the erection of a customs mill. This is es-

sentially what is known as a rich man's camp. That is to say, it requires large sums of money to be put into the ground before you can expect to get a dollar out. I would like to utter a note of warning against the embarkation in the enterprise of creating a producing property until those embarking in the enterprise are well assured by conservative engineering advice, as to the amount of money that will be required before they can hope to get any return. If care is exercised in this, much loss and heart-burning will be avoided, because if an enterprise is started with too little money in the treasury first to develop, and (even if they have the ore) to follow up that development with a mill to produce the gold from the ore, the inevitable result must follow, of bankruptcy and reorganization.

"There is no more useful calling in the world than that of mining. The farmer, the fisher, and the miner are the only three natural producers. For the upbuilding of your country the farmer, of course, takes the first rank. That occupation creates more independent, self-reliant individual citizens than any other. The fisherman produces a hardy race, the natural defenders of your country by sea. The miner takes rank with either as producer not only of a great labouring class, making most useful citizens, but he produces the raw material from which the manufacturer creates the tools, the foundation of modern machinery and wealth.

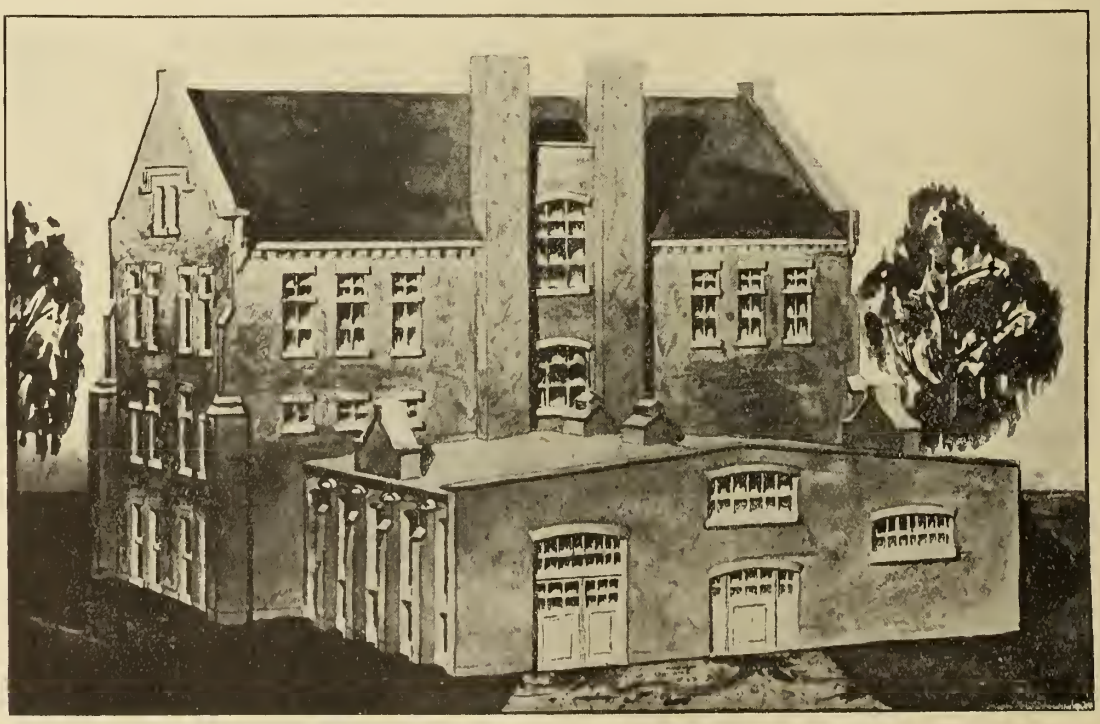
"How, then, does the case stand as to Canada in relation to her mineral future? In 1910 you produced ninety million dollars of mineral wealth, metallic, and non-metallic; forty-five millions in non-metallic, such as coal, cement, etc., and forty-five millions, metallic. In my belief you are scarcely on the threshold of mineral development. It behooves such men as yourselves, therefore, to see that the mineral development is conducted on businss lines. Again may an outsider offer his meed of tribute to the advantage which you possess in the administration of British justice, and British fair play. Capital is timid, but while you maintan your reputation for even-handed justice administered promptly, you may rest assured that capital will be bold, so long as it feels that the standard of Canadian public life, whether in Parliament or on the bench, is maintained on its present high plane.

"I am happy to offer this tribute after years of mining experience in this country. May I suggest that he is the best friend to the cause of Anglo-Saxon liberty, who fosters and maintains the present friendly relations between the people of the flag under which I have the honour to live and the Union Jack under which you live. United they may front the world. My greatest wish is that they may so rest united and further the cause of Anglo-Saxon supremacy."

Mr. C. W. Merrill, head of the Merrill Metallurgical Company, of San Francisco, who designed the mill, stated that after a study of conditions at Porcupine he had come to the conclusion that there were few superior in facilities and local conditions from the economical extraction of gold from its ores. Porcupine has an abundance of water, its labour was of high class in comparison with many other camps, and it had, he believed, great possibilities in regard to the development of large quantities of ore. He would not say that the Dome would have a thousand stamps, but he would say that no one could say how many stamps they might have. Not only were conditions favourable for cheap extraction, but the ore itself was one of the best that it had ever been his experience to meet with. As to results at the Dome mill, they had not gone far enough to make a positive prediction, but they were perfectly safe in saying that they would be able to make a recovery of no less than 95 per cent.

NICOL HALL, SCHOOL OF MINING, KINGSTON

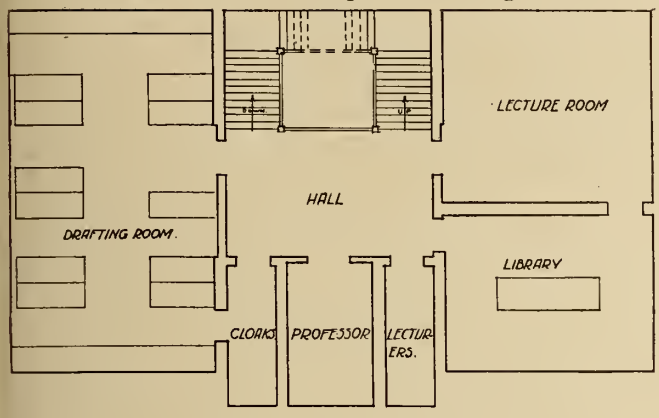
By J. C. Gwillim.*



*Professor of Mining, School of Mining, Kingston

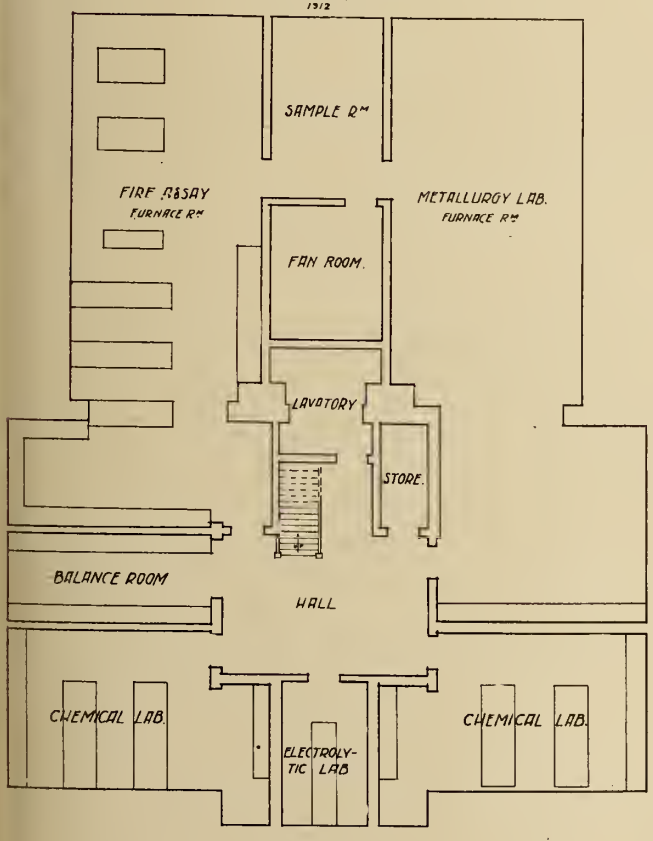
Nicol Hall is the latest addition to the group of grey limestone buildings on the grounds of Queen's University. Beside it is the newly built and equipped Gordon Hall, devoted entirely to chemistry, a gift of the Ontario Government, to the School of Mining.

Nicol Hall is to be given over entirely to mining and metallurgical engineering, as may be seen by the accompanying floor plans, which are the inner outlines of the architects' more complicated designs.



·First Floor Plan·

~ Nicol Mining & Metallurgy Building ~
~ School of Mining ~
~ Kingston, Ont. ~
1912

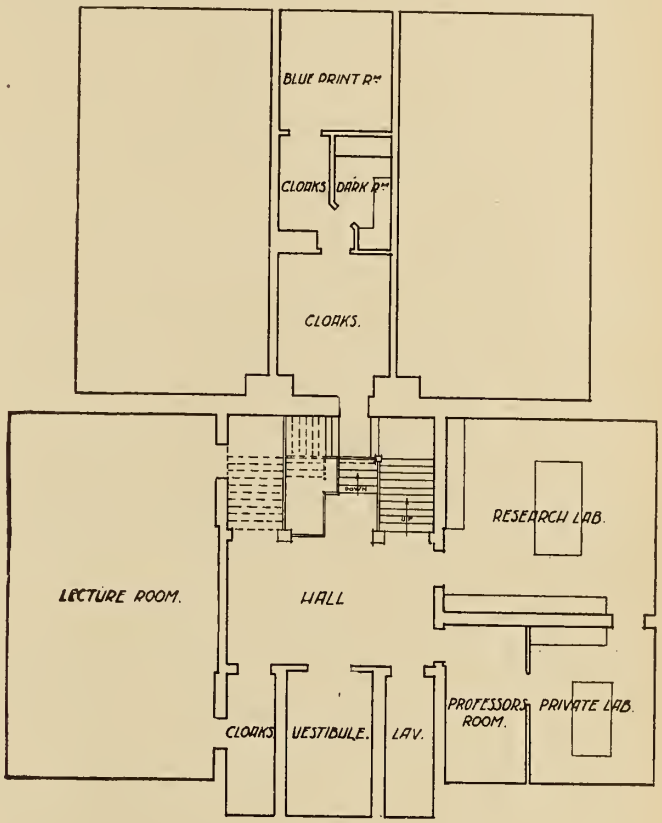


·Semi-Basement Floor Plan·

The building is composed of two parts: the main building of three floors and an attic, 80 feet x 48 feet; and the furnace building a single floor, high story, stone structure, 64 feet by 48 feet, with a few small rooms over its central portion.

This combined building will, it is expected, accommodate the Department of Mining and Metallurgy in a way suitable to its merits and its long patience with make-shifts in the other buildings. The milling of ores and concentration work will still be carried on in the old wooden building, which has served so well, until the happy day when a solid stone structure is attached to these new laboratories.

Besides supplying laboratories, library, and lecture rooms for the students, there will be carried on for the Federal Government Mines Branch some extensive metallurgical research work. This building merits more than passing notice for it is the gift of a professor, William Nicol, and of graduates and alumni of the School of Mining.



·Ground Floor Plan·

At the time of its inception, May, 1910, there were 254 graduates, all young. Eighty-eight of these were graduates in mining and metallurgy, but one hundred and twelve subscribers contributed about $10,000. Another $10,000 was subscribed by an older graduate of Queen's and present Governor of the School of Mining, whose name is much honoured in the mining world.

The principal gift, and the original idea, came from Professor Nicol, whose devotion to mineralogy and his Alma Mater, Queen's University, inspired him to build a suitable home for mining and metallurgy, partners of the earlier history of the School of Mining, in old Carruthers Hall.

Over its front entrance is graven "Nicol Hall," and upon the corner stone is this inscription: "The corner stone of this building erected with money given by Professor William Nicol and Graduates in Science was laid by James Douglas, Esq., LL.D., October 18th, 1911."

The floor plans are from the office of Power & Son, the architects, ; the perspective view from O. G. Wellton, and the photos from Dr. Clark, of the School of Mining.

THE MINING LAW—ITS FAULTS AND SUGGESTED CHANGES

By Horace V. Winchell.*

The question of national mining laws is of special interest just now in both Canada and the United States. Attention has been widely called to the many defects and general insufficiency of existing statutes, and wherever the matter has been discussed, the need for revision has been admitted. In the United States during the past decade there has been frequent agitation of the subject. Public officials connected with the administration of our land and mining laws have urged legislation along certain lines; the Director of the Geological Survey and the Secretary of the Interior have discussed it in their annual reports; and the matter has engaged the attention of Presidents, Mr. Roosevelt and Mr. Taft discussing it in messages to the Congress. Associations and societies of various descriptions, after due consideration, have passed resolutions demanding this or that measure of relief, and in some cases committees have been appointed for the purpose of making recommendations as to the principles to be followed in new legislation. Thus, a few years ago a committee of prominent mining engineers, among whom were John Hays Hammond, and James Douglas, united in a report upon this subject to the Government at Washington; but nothing came of it, and so far as I can learn, the report was never even published. More recently the matter has again been agitated and committees for its consideration have been appointed by the American Mining Congress and the Mining and Metallurgical Society of America.

Canadian Proposals for Change.

The United States might well profit in this matter by the very sensible and systematic method which has been adopted in Canada to facilitate the proper settlement of this most important question. Here, as I am informed, a committee of engineers and attorneys has been selected by the Canadian Mining Institute to draft a bill for a Canada Mines Act, and to present the same for consideration and adoption by the Dominion Parliament. In other words, you Canadians are proceeding in the best way to procure laws framed by experts; and none can doubt that statutes thus prepared are in every way superior to enactments whose subject matter is prepared by theoretical political economists on the one hand or by agitators and professional politicians on the other. I wish, therefore, at the outset to commend the Canadian Mining Institute for its very wise procedure in this matter and admonish you not to weary in well-doing, not to be disheartened at slow progress. When you have accomplished what you have set out to do, you will not only have that pleasant sense of satisfaction which succeeds the consciousness of duty worthily performed, but you will have made an investment of time and labour which will return a thousand-fold in actual wealth and prosperity. For that country which is willing to be guided as to the handling and development of its mineral resources by the crystallized policies of its mining engineers is the country whose mining industry will be at once best managed and the most productive of material blessings for all the people.

Systems of Mining Law.

The mining laws of a country are those legislative enactments or customs established by precedent which control the acquisition and tenure of mining rights and property, in contradistinction to "mining regulations" which have to do with the methods and appliances used in operating mines. The principles underlying the mining laws of various countries have been found susceptible of classification into two groups: "(1) The concession system under which the state or a private owner of mining property has the right to grant concessions or leases of such mining property to individuals or corporations at discretion, or under certain general restrictions. (2) The claim system, under which any individual, under certain general specified restrictions, generally as to nationality and colour, has the right to locate on discovery or otherwise certain limited areas of ground, and under certain conditions to hold, work, and dispose of the same."

Under the concession system the right to grant lies with the owner, and it is said that five-sixths of all the mining areas of the world are held under it; under the claim system the right to claim mining ground lies with the locator or discoverer. The latter is the system underlying the laws of Canada and the United States, as well as South Africa and Australia; but there are fundamental differences in these countries as to the nature of the possessory right and the character of title finally obtained.

The Concession System.

Originating in the ancient proprietary rights of kings and feudal lords to the minerals in the ground, the concession system still prevails in more or less modified form under all the ancient civilizations of the world. Its chief advantage is in the retention by the state of the right to select and control the operations of its concessionaires, thus assuring proper capitalization and development, good management, economical use of raw material, and the payment of rental or royalty. To this system there have been objections as follows: (1) that it places unduly large property control in the hands of a few men, and takes from the poor working man the chance of sudden wealth; (2) that by destroying competition in the sale of mines it places in the hands of the holders of large concessions the power of unlimited capitalization and speculation; (3) that it leads to the tying up of large areas of mining ground and thus restricts the employment of labour and the mineral production of the country. To these objections it may be answered that a relatively small number of men will always have control of the money with which to buy and develop mining property, no matter how it be granted; that the Government may easily regulate the capitalization of its lessees; and that a large, strong corporation is usually better prepared to thoroughly prospect its territory than the unaided though far more numerous prospector. If diligent prospecting is required as a condition in the concession, the system of

*Presented to the Canadian Mining Institute at the Toronto meeting, March the 6th.

preference rights to explore large areas with the further right to take out leases of limited area would seem to present many practical advantages for new and unexplored countries.

The Claim System.

The claim system grew out of conditions in early mining days in the United States and Australia. The Argonaut horde who invaded California in 1849 and a few years later rushed to Australia were in many cases allowed to make their own local rules as to size of claim, method of discovery, staking, recording, and obtaining title. In the United States the usages thus established were later sanctioned by Congressional enactment which grew into our present system of mining law, and also served to greater or less extent as a model for Australia and other nations. This system, "however necessary in the peculiar circumstances of its inception, should have been altered as soon as changing circumstances permitted," but instead it has been patched and interpreted by judicial decision until the United States has to-day the most wretchedly inadequate and antiquated law with which a great country is anywhere afflicted. Instead of fostering the mining industry the law as it stands to-day and as interpreted by the judicial and executive branches of the Government creates confusion, entails unnecessary expense, causes waste, and retards development.

Common Principles.

Two fundamental principles are common to the mining laws of all countries: (1) The right of the mineholder to a perfectly secure and indefeasible title to his property so long as he fulfils certain specified conditions entirely within his own control, and (2) the right of the state or other landlord to certain rents, royalties, or taxes on the property or its output, and to the reasonably constant operation of the mine.

In the power of the Government to fix the rate of royalty or taxes lies also the ability to promote or to discourage prospecting and mining. If the chief aim of the Government is the development of national resources and the increase of general prosperity and business, its policy for the disposition and holding of its mineral lands will be most liberal. If there is a desire to enrich the public treasury directly by means of revenues from taxes upon mines, the result may be a rapid decline of the mining business, and a shifting of the population to more favoured communities. It is frequently stated, and truly, as I believe, that the principal factor in the growth and development of the United States and Canada has been the liberality of their policy for the distribution of their public domain. Freely, or at a nominal consideration, homesteads and mines have been offered to all who chose to come and settle, to develop and use. If during the past fifty or seventy-five years the policy of conservation as now advocated by its most ardent proponents had been expressed in our statutes North America would be for the most part as little developed as Alaska. There would be a line of settlements along the Atlantic and a few fishing hamlets on the Pacific. The interior of the country would still be to a very large extent bottled up and conserved; and the country would perhaps be still importing the bulk of its copper and iron as it is its supply of tin, platinum, potash, and nitre.

Mineral Wealth of the United States.

To speak to an audience of mining men of the importance of a liberal mining law is like carrying silver to Cobalt or copper to Butte, but since these remarks may find a wider audience a few words upon the extent of our mining industry may not be out of place. First, with reference to the United States. The annual products of the mines of the United States now exceed $2,000,000,000 in value. They contribute 65 per cent. of the freight traffic of the country. The industry employs over a million men at the mines and twice that number in handling, transporting, and manufacturing the products. The total value of our metallic products during 1907 was $900,000,000; of mineral fuels, $788,000,000; and of non-metallic mineral products, other than fuels, more than $378,000,000. During the year we imported mineral products to the value of $255,000,000, and exported mineral products to the value of $340,000,000. From the beginning of coal mining in this country in 1814 to the close of 1907, there were mined nearly seven billion (6,865,000,000) tons. Adding to this the one-half additional supposed to have been wasted in mining, gives a total of more than ten billion tons taken from the supplies originally available. The amount of easily accessible and available coal in the United States, exclusive of Alaska, is estimated as 1,400,000,000,000, while the total, including Alaskan reserves of 150,000,000,000 tons and the coal not easily accessible, is perhaps double this amount, and the country is as yet but partly explored. It may be remarked in passing that since the United States is now mining about 500,000,000 tons of coal annually we would appear to have a coal supply sufficient for about 6,000 years at the present rate of consumption, even without borrowing or buying from the enormous coal bins of Canada. Can anyone doubt that the provisions of the laws governing the disposition of the fifty million acres of coal land still remaining in the hands of the Government is a matter of importance to a nation with an annual coal consumption of five tons per capita?

Area of Public Lands.

Figures are wanting as to the quantity and value of other mineral products estimated to remain within the unappropriated public domain. The land area of the United States, excluding Alaska and the insular possessions, is about 3,000,000 square miles, or 1,920,000,000 acres. Of this area over half is arable, and a little less than half is occupied as farm land. About two-thirds of the land has passed into private holdings. Of the original acreage there remained on July 1, 1908, 387,000,000 acres, or about one-fifth open to entry. Nearly all of this is arid or otherwise unsuitable for settlement by families. There are also about 235,000,000 acres in national forests, national parks, and other lands reserved for public use. Of the entire area of 1,920,000,000 acres there remain unalienated about 622,000,000 acres, or nearly one-third within which valuable minerals may still be discovered. Is it not a matter of vast importance to provide most carefully for the exploration, disposition, and development of this vast empire? In what direction can the fostering care of government be more profitably and properly extended? And when Alaska, with its undeveloped area of about 360,000,000 acres and the island possessions with 90,000,000 more acres, are taken into account, is it not clearly one of the largest questions before the public to-day?

Canadian Conditions.

In Canada the percentage of unappropriated public domain is larger than in the older country lying along its southern border, and there is yet ample time to avoid the mistakes of omission and commission of the United States. With a total area of 2,118,814,000 acres, you have still in the hands of your Provincial and Dominion Governments the larger part of your acreage. Your annual production of minerals is valued at about one hundred million dollars. At its present rate of increase it may easily amount to $500,000,000 by 1950. Can your engineers find any more truly national work than to aid in the framing and adoption of the best possible laws for the protection and encouragement of the mining industry? Is it not apparent that there is a very close connection between mining laws and that conservation idea so dear to the imagination of the majority of our people to-day? If the true aim of conservation be "maximum use with minimum waste," is it not evident that to be consistent with this theory, mining laws must be liberal as to opportunity and inducement for the individual or corporation, and at the same time as scrupulous and exact in supervision and scientific regulation as the conditions of industry and the laws of political economy will permit? If the terms and conditions for acquiring mining property be so difficult as to materially restrict the number of prospectors or development companies there will be far less than "maximum use"; and if no right of supervisory control is retained by the Government there will seldom be "minimum waste." The best code of mining laws will inevitably aid in the development of natural mineral resources, and at the same time have a tendency toward the right species of conservation, as contradistinguished from that variety of it which seems to aim at disuse, stagnation, and paralysis.

Failure of American Mining Law.

In many particulars the present mining law of the United States is admittedly a failure, and in other respects it has both its critics and defenders. I propose to mention briefly some of its defects, and some possible amendments, not because there seems to be any danger that our worst faults will be copied by others, but in the way of general illumination of a question which is not always clearly understood even by our own people.

Briefly stated, the United States mining law, known as the Act of 1872, provides for location by discovery; possession perpetuated by annual assessment work; and title in fee simple to the surface and minerals obtained after the expenditure of a certain amount of money by the payment of $5 per acre, and the observance of certain formalities as to survey, etc. The metal-mining laws do not apply to all of the states. They are made applicable to the western states and territories with the exception of Michigan, Wisconsin, Minnesota, Missouri, Kansas, and Texas. Mining locations are not recognized in the states east of the Mississippi River, nor is there in any state legal authority permitting one man to prospect or mine beneath the surface of ground owned by another without consent of the latter. To this statement there is one important exception, and that lies in what is called the "apex law" under which the owner of the outcrop of a vein in mining claims has the right to follow and mine the vein on its downward course beneath the surface of a claim owned by another. This law has proved more productive of expensive litigation than of economical mining, and in many of the more recently established and more progressive mining districts has been made inoperative either by common agreement or by compromise between adjoining owners. Placer mines are likewise located by discovery and held by annual work and acquired by purchase in fee-simple forever. Known veins within placer locations must be declared and paid for separately or else they are excepted from the placer patent and can be located by others in "lode claims." All veins on placer ground not known to exist at the time of application for patent belong to the grantee, but without extra-lateral or apex rights. If an applicant for a placer patent can be shown to have had knowledge of a valuable lode within his lines prior to the making of his patent application, his title as to that vein may be cancelled for fraud at any time upon application of a contesting locator. There is no limit to the time for such contests and they are still being brought in some cases twenty years after placer patent. The law is very defective on this point; for it frequently happens that veins discovered to-day have a value by reason of improved transportation facilities or metallurgical processes, although these same veins were of no value whatever when the placer claim was located and patented. The owner of such a claim is sometimes put to the expense and annoyance of defending such contests repeatedly, since there is no limit to the number of contestants. The law should be amended so as to make it impossible to attack a placer patent on such charges after a reasonable term of years. Another absurd feature of the placer act is that providing for the location of oil, gas, iron ore, and other deposits in the same manner as auriferous gravel. Coal lands are sold by the Government upon an appraised valuation, and the amount of land that may be legally acquired is limited for an individual to 160 acres and for an association to 640 acres. Tracts of such limited area do not often justify the installation of the most efficient equipment, and economical operation is therefore impossible under the terms of the very law which was expressly designed to promote economy and prevent monopoly.

Absence of Leasing.

Under the present United States law there is no general system of separation of surface from mineral rights, no leasing of mines from the Government, no payment of rental or royalty, and no Federal supervision or control after location and patent. Taxes are paid to the state and county, and mining regulation is attempted by many states. Unfortunately there is no uniformity of principle and practice as to these matters, nor any stability, nor assurance of permanence in any state either as to methods of operation required or basis of taxation.

Although it has been successful elsewhere and has much to recommend it, the Government leasing system has never met with much favour in the United States. There is not at present strong opposition to grants in perpetuity by the Government, although the leasing system has been recommended by some organizations and public officials. There is a hesitancy to create more bureaus; for bureaucratic administration is not popular with those who have tried to transact business with many of them.

Requirement of Discovery.

Aside from the generally condemned apex law, there are two or three features of our present system which should be speedily remedied. The first is that provision of the law requiring a discovery of valuable mineral before location. There is really no sense in such a requirement. What seems valuable to one man is often worthless to another; and what is of no value to-day may be worth a million in a year or two. Moreover, it sometimes requires a year's work and a shaft several hundred feet deep before the actual discovery of ore, even though the surface indications give ample promise of its existence below. Every mining engineer and geologist knows that many ore deposits have no value whatever immediately upon the surface of the ground. Why not allow a prospector to stake out his mining claim wherever he chooses on the public domain, and hold it so long as he performs the required amount of development work?

Limit the Number of Locations.

Another defect in our present law is that permitting a prospector to locate an indefinite number of mining claims and to hold them without doing his assessment work. Many promising districts are kept from becoming hives of industry and producers of mineral wealth by the tying up of their territory in this way. The prospector should be restricted in the number of his locations, and real development work should be exacted.

Right of Appeal.

The last important defect in the United States and Alaskan mining and land law to which I wish to call attention is the lack of any provision for appeal to the courts from the decisions of administrative officers. It is contrary to the general spirit of our institutions and an anomaly in constitutional government to take away from any citizen property rights to which he considers himself justly entitled under the law, by the mere fiat of an appointed government official who is here to-day and gone to-morrow. To place in the hands of such officials the final dicta in matters involving property valued at hundreds of thousands of dollars, and to provide no method of appeal to any duly constituted non-political judicial tribunal is not only to subject the said officials to great and unnecessary tests of moral courage and fidelity, but to require in them the qualifications of superior judges and experience in the interpretation of the law which many of them cannot be expected to possess. Serious injustice may be done without any remedy at law to the defeated applicant. In the interests of justice, provision should be made for appeals in important cases, and perhaps in all cases, from decisions of the Commissioner of the General Land Office or the Secretary of the Interior to some court of competent standing and jurisdiction, whose decisions could and would be accepted by the public and the interested parties as justified by the law and evidence. I am gratified to notice that this point has been carefully covered in the recommendations of the Canadian committee on this subject.

Comparison of English and American Systems.

A comparison of the mining laws of the United States with those of other English speaking countries will disclose a fundamental difference in the underlying theory of the proprietorship of minerals, and hence in the attitude of the courts upon the subject as reflected in their decisions. Recent publication of a report upon the "Mining Laws of Australia and New Zealand," has caused considerable discussion because of the fact that its recommendations have been to a certain extent adopted by other government officials in their annual reports and public addresses. This report apparently assumes a similarity between British laws and those of the United States in certain respects where actually a wide difference exists.

Absence of Regalian Right.

"Neither regalian right, nor anything similar, has ever existed in or been asserted by the United States. While it has sovereign authority, and the power to enact such statutes as Congress in its wisdom sees fit, within the limits of the Constitution, its right is dependent upon and controlled entirely by statute." Furthermore: "A distinction exists, and should be observed between ultimate ownership and right to govern on the one hand, and the exercise of regalian right, after possession and title is parted with, on the other. The former exists in the United States, the latter does not. The ownership, as well as the manner of exercising control, of mineral lands is regulated in the United States by statute."

"The fundamental principles of the common law of England were to a certain extent ingrafted into our legal system when we separated from the mother country and were and still are the rule of action in the absence of legislation. As a general rule, under the common law minerals were the property of the owner of the land, the property in the surface carrying with it the ownership of everything beneath it. Wherefore the ownership of the surface was the best prima facie title to the ownership also of the mines. This prima facie ownership continued until rebutted by showing either: (1) that the land contained 'royal mines'; or (2) that it was subject to some particular custom that defeated the prima facie ownership, as in the case of the tin mines of Cornwall and Devon and the lead mines of Derbyshire; or (3) that the ownership of the mines and minerals had become in fact, from divers causes several and distinct from the ownership of the soil and surface."

By the term "royal mines" was meant mines of gold and silver. These belonged exclusively to the Crown, by prerogative, although in lands of subjects. In this respect the rule was the same as under civil law. It was at one time contended that mines or mineral deposits containing the baser metals in combination with either gold or silver were royal mines. This contention, however, was set at rest by statutes enacted during the reign of William and Mary, wherein it was declared that no mine should be deemed royal by reason of its containing tin, copper, iron, or lead in association with gold or silver. Thus, those mines only came to be classed as royal in which were found the precious metals in the pure state. Briefly stated, the regalian right to mines, as recognized in England, was confined to those of the precious metals, gold and silver. The base substances belonged to the owner of the soil, except in certain localities where immemorial custom had modified the rule.

At the present time "England has no general mining laws. Legal questions governing the ownership of mines and minerals have been determined on the general principles of the common law."

As distinguished from the common law the theory of the civil law is thus clearly stated by H. W. Halleck:

"All continental publicists who have written upon the subject lay down the fundamental rule, that mines, from their very nature, are not a dependence of the ownership of the soil; that they ought not to become private property in the same sense as the soil is private property; but that they should be held and worked with the understanding that they are by nature public and that they are to be used and regulated in such a way as to conduce most to the general interest of society."

C. H. Lindley has presented concisely the theory of our leading mining lawyers as to governmental control after patent, as follows:

"The Government of the United States does not concern itself with mining lands or the mining industry after it parts with the title. This title vests in the patentee absolutely to the extent of the property granted. No royalties are reserved; nor is any governmental supervision (except perhaps in the isolated case of hydraulic mines in California) attempted. Upon the issuance of the deed of the Government the mineral land becomes private property, subject to the same rules as other property in the state with reference to the transfer, devolution by descent, and all other incidents of private ownership prescribed by the laws of the state. Briefly stated, property in mines, once vested absolutely in the individual, becomes subject to the same rules of law as other real property within the state."

Did the United States Waive Its Right?

But lately we are told that the United States "has never waived its right to the precious metals," and that "in all states where the Federal Government has never owned the land, and there are 19 such states, the ownership of the precious metals lies with the state government," and "that in states where the ownership of the land has been vested in the Federal Government the ownership of the precious metals in like manner, lies with the nation, and that as against the Government no person has a right to gold and silver in any lands in the United States unless this right has been specifically granted to him in the deed of conveyance."

Here is a most radical difference of theory. Mr. Veatch would have the Government resume dominion and control of gold and silver and by implication of other metals beneath the surface of all lands except those in which minerals were specifically conveyed. He thinks the Government has the right to grant prospecting permits beneath private property and the power to collect royalties on minerals produced as a result of such explorations. In other words he insists upon it that the United States is in possession of a regalian right, but does not know it or has forgotten it. He would have the people wake up and seize what is theirs from all mine operators who are thus wrongfully removing from the ground valuable minerals never specifically granted to them by the Government. It can readily be seen that it is a matter of no small moment to ascertain whether such a thing is possible. Here is proposed mining law revision with a vengeance. I have not at hand the figures to show the relative proportion of lands patented as mineral lands and in all other classes; but have no doubt that the lands granted under the homestead, pre-emption, desert land act, private entry, townsite, timber and stone, railroad grants, and all other laws exceed in the aggregate the lands under the mining laws four to one. Now, if the minerals under three-fourths of the privately owned land west of the Mississippi, and practically all the lands east of it, really belong to the Government, it is high time for the Government to assert its right and to exercise some sort of control over its vast possessions. This is either a nebulous and iridescent dream or a very important discovery. If the former the bubbles should be punctured, and the mist dispelled, before arousing too many false hopes; if the latter the work of mining law revision at once assumes paramount importance. Fortunately, we have some illuminating opinions of the United States Supreme Court, as a guide and cloud dispeller.

Opinions of the Supreme Court.

In the case of Deffeback v. Hawke, 115 U.S., p. 400, Mr. Justice Field, after reviewing at length the various acts of Congress relating to the public lands of the United States, concludes as follows:—

It is plain, from this brief statement of the legislation of Congress, that no title from the United States to land known at the time of sale to be valuable for its minerals of gold, silver, cinnabar, or copper, can be obtained under the pre-emption or homestead laws or the townsite laws, or in any other way than as prescribed by the laws specially authorizing the sale of such lands, except in the states of Michigan, Wisconsin, Minnesota, Missouri, Kansas. We say "land known at the time to be valuable for its minerals," as there are vast tracts of public land in which minerals of various kinds are found, but not in such quantity as to justify expenditures in the effort to extract them. It is not to such lands that the term "mineral" in the sense of the statute is applicable. In the first section of the act of 1866 no designation is given the character of mineral lands which are free and open to exploration. But in the act of 1872, which repealed that section and re-enacted one of broader import, it is "valuable mineral deposits" which are declared to be free and open to exploration and purchase. The same term is carried into the Revised Statutes. It is there enacted that "lands valuable for minerals" shall be reserved from the sale except as otherwise expressly directed, and that "valuable mineral deposits" in lands belonging to the United States shall be free and open to exploration and purchase. We may also say lands known at the time of their sale to be thus valuable, in order to avoid any possible conclusion against the validity of title which may be issued for other kinds of land, in which years afterward, rich deposits of mineral may be discovered. It is quite possible that lands settled upon as suitable only for agricultural purposes, entered by the settler and patented by the Government under the pre-emption laws, may be found, years after patent has been issued, to contain valuable minerals. Indeed this has often happened. We, therefore, use the term known to be valuable at the time of sale, to prevent any doubt being cast upon titles to lands afterward found to be different in their mineral character from what was supposed when the entry of them was made and the patent issued.

And in the case of the Colorado Coal Company v. the United States, 123, U. S., p. 528, Mr. Justice Matthews uses the following language:

"A change in the conditions occurring subsequently to the sale, whereby new discoveries are made or by means whereof it may be profitable to work the veins as mines, cannot affect the title as it passed at the time of the sale. The question must be determined according to the facts in existence at the time of the sale. If upon the premises at the time there were not actual 'known' mines capable of being profitably worked for their profit, so as to make the land more valuable for mining than for agriculture, a title to them acquired under the pre-emption act cannot be successfully assailed.

Since these are the opinions of the highest court in our land it is probable that although the advocates of radical revision of our mining law may be able to change the form of its superstructure they will hardly be able to mine deep enough to disrupt its solid rock foundations. It will continue to present fundamental differences from the mining law of Canada on the north, and from that of Mexico on the south, but rights already granted will not easily be set aside.

General Conclusions.

Summarizing these somewhat disjointed remarks, it appears in general that:

1. The development and prosperity of all countries is vitally affected by the provisions of their laws relating to mines.

2. Greater inducements and more liberal rewards should be offered in unsettled countries than in districts of denser population.

3. Continuous development work should be required and rigidly enforced, but

4. No narrow limit should be placed on the amount of property held by an individual or corporation so long as the aggregate amount of work equals the product of the net units of area held multiplied by the amount of development required for each unit area.

5. In case of any contest either between rival claimants or between a locator and the Government full privilege should be given of appeal to the courts as in other matters wherein the title to property is involved.

In addition to the above, and with particular reference to the United States, taking into account the system of mining law there already established by long years of precedent and custom, the following recommendations are tentatively presented:

(a) The apex law should be abolished.

(b) Mining claims should be locatable regardless of a "discovery" and held only so long as the speci fied development work is performed in good faith.

(c) Placer locations should be limited to deposits of loose materials above solid bedrock.

(d) A statute of limitations should establish a reasonable term of years beyond which placer patents shall be immune from attack on the ground of misrepresentation in the patent application.

(e) Special statutes should be enacted providing for the location and working of oil, phosphates, rare earths, haloids, and other mineral substances not specifically mentioned in the present laws.

(f) Existing titles should be fully recognized and confirmed and no effort should be made to create retroactive legislation.

I have purposely avoided any discussion of the relative advantages or disadvantages of permanent alienation of title as opposed to the government leasing system. For Canada, I am confident the latter system is to be preferred, and am pleased to find myself upon this point in accord with the majority of Canadian mining men.

OIL SIGNS AND PROSPECTS IN COLORADO AND ALBERTA

By Arthur Lakes.*

The account as given by the Government geological survey of the favourable oil signs of Alberta is of much interest to those familiar with oil signs and occurrences in Colorado along the eastern side of the Rocky Mountains, and in Wyoming. The general geology of the Rocky Mountain region in Alberta seems similar to that along their east flank in Colorado and in parts of Wyoming. The rocks are the same from the granite up with the exception of the Devonian which is not represented in this portion of Colorado, the geological series there, as in Alberta being mainly of Mesozoic character with the cretaceous as a prominent member, and the principal oil carrier. The sedimentary strata appear in both regions to be tilted near the axis of the granitic range and to become flatter as they pass beneath the plains. The Dakota sandstones in which seepages appear in both regions are covered by a heavy overburden of great thickness of marine cretaceous shale which is generally too deep for wells to exploit them. No productive wells have so far been found in Colorado or the Dakota sandstone despite abortive efforts at prospecting its attractive looking seepages and tar exudations. The productive wells in this state, viz. those at Boulder and Florence are within and confined to the marine cretaceous shales. In Wyoming the Dakota cretaceous sandstones are the favourites for the exhibitions of oil seepages, the apparent reservoir of oil is however often traceable to much lower sources in the palaeozoic rocks.

A marked feature of the surface geology of Wyoming is the numerous anticlines and corresponding synclines into which the sedimentary strata including the oil bearing ones are thrown, folded or crushed together.

These anticlines are sometimes in the form of quaquaversal domes, the summits of which are favourable for gas whilst the slopes may carry oil and the corresponding synclines water. A powerful gas spring was tapped in one of these lower cretaceous domes near Basin City in the Bighorn Basin which after it caught fire illumined the country around for many miles around for some months.

*Superintendent The Ymir-Wilcox Development Co., Limited, Ymir, B.C.

Although the marine cretaceous series flying above the Dakota is the present seat of the productive wells in Colorado, oil signs have been observed at various other horizons from the Precambrian below to the upper Tertiary above, but no productive wells have so far been found outside of the cretaceous shale zone. In this both at Boulder and Florence, the wells appear to occur in independent fissures with no connection with any under or overlying formations, and the oil seems indigenous where found. Deep testing wells put down nearly to the Dakota have not found any appreciable amount of oil below the zone in the shales where it is usually found i.e., within 3,000 feet of the surface.

Oil seepages are not uncommon at various points along the foot hills of Colorado in the outcrops of the uptilted Dakota sandstones. Wells put down directly on these seepages and on the uptilted portion of the sandstones of course failed to find oil in quantity whilst those bored at a greater distance from the outcrops were precluded from reaching the Dakota by the thick overburden of shale. For this reason the Dakota sandstones in Colorado have never been proven as to whether or not they are an oil reservoir as their surface seepages might imply both in this region and in Alberta. The porous character of the rock and its being well packed between impervious shales would make it an excellent reservoir for either oil, gas or artesian water. In Southern Colorado and South Eastern Kansas where it favourably underlies, it is the principal source of artesian water in those acid districts, the same is the case in parts of Dakota, but in none of these instances do we hear of it as a productive source of oil. The Dakota would seem by its origin and structure and position in the geological series to act more the part of a catchmat or recipient of oil from other sources than a generator of the same.

At Florence, Colorado, although the outcrops of Niobrara limestone as well as the Dakota sandstones, show no signs of oil the Jurassic marls and shales below them have prominent oil seepages flowing into Oil Creek. These have only been tested by shallow wells, but would also seem to be independent and indigenous to the rocks where found because no traces of oil have been found by boring or seepages in the underlying Palaeozoic rocks down to the Pre-Cambrian or granitic series now in any rocks intervening between them and the overlying reservoir fissures on the cretaceous shales at the Florence horizon.

The seepages observed so abundantly in Colorado and Wyoming and especially in Alberta in the Dakota sandstones would certainly suggest more regions to be underlaid by a considerable oil field whose resources we have no reason to believe exhausted by such seepages and leaking or the outcrops as observed. Seepages unless erosion is in rapid progress alongside of them are apt by hardening to form a protecting cap over the exuding points and prevent further leakage If the money that has been wasted in putting down wells close to the seepages had been expended in more judiciously located wells, we should know more of these fields. The desirable point in such fields is to find some locality where by erosion or other causes the thickness of the overlying shales is sufficiently demonstrated to admit of reaching and testing the underlying cretaceous sandstones with a reasonable depth.

Making Use of Hydraulic Power.

The introduction of a small tap into a main water-pipe line does not appreciably reduce the pressure, but by this means power can be obtained for various purposes. In a case known to the writer water to operate a movable motor is taken from the main pipe line through a fire hose, and for any work around the mine the necessary power can be obtained from this movable motor.

Over two hundred thousand tons of coal are now in the coal heap at Dominion No. 2 Colliery. The heap is still growing and will likely reach the 300,000 ton mark before the shipping season commences.

At the Talisman mine, in New Zealand, a water jet is used during drilling. The supply is taken from the main pump column and the pressure ranges up to 140 pounds per square inch. At blasting time a three-sixteenth inch nozzle is screwed to the end of the compressed air pipe and air is allowed to blow through as soon as the fuses are lighted. This air rapidly dissipates the fumes from the powder.

Covered Coal.—Late Westphalian experiments seem to indicate that little is gained in attempts to preserve coal by excluding air under water or in special atmospheres. The tests were made with lumps about ¾ of an inch in diameter, a portion being placed in half gallon jars under water, carbon dioxide, flue gases or sulphurous acid vapours, and another portion being exposed in the open air. Though different coals gave unequal results, the loss of gas was not much influenced in any case by the protective treatment. It was recommended that, if anything is to be done, the coal piles should be provided with roofs, and thermometers should be inserted so as to obtain warning of any tendency to spontaneous combustion.

The Coal-Mine Vacuum Cleaner.—The vacuum-cleaning of coal-mines is a new idea for preventing risk from dust. A Scottish electrical firm has devised a special mine-cleaner, which includes a jet of pressure air for raising the dust from every crevice, with a bell-mouthed suction tube behind the air-nozzle, and a separator or filter that retains the dust sucked in and permits the air to escape. A single electric motor drives both the suction fan withdrawing the dust and the small pressure fan that produces the jet

ALASKA TREADWELL CONCENTRATES.

At the Alaska Treadwell cyanide mill the concentrates are ground to pass 200 mesh, given a preliminary agitation with 2 pounds of lime solution, thickened by decantation and cyanided. The treated pulp is filtered in Kelly presses, from which the solution passes to Merrill precipitation presses. The precipitate is acid treated, melted in a specially constructed oil burning furnace, and refined in Faber du Faur testing furnaces. In the company's assay office there were 4,741 samples taken from the mine during 1911 and 3,230 from the mills assayed. In addition to this work, all the samples from the other mines and mills on Douglas Island, the cyanide plant and experimental work, also the Alaska Juneau Gold Mining Company, amounting to 18,029, as well as the retorting and assaying of all bullion collected in the mills, was done at this company's assay office. For several years past the concentrates have been locally treated instead of shipping them to the Tacoma smelter.

THE DOMES OF NOVA SCOTIA

By T. A. Rickard.

PART I.

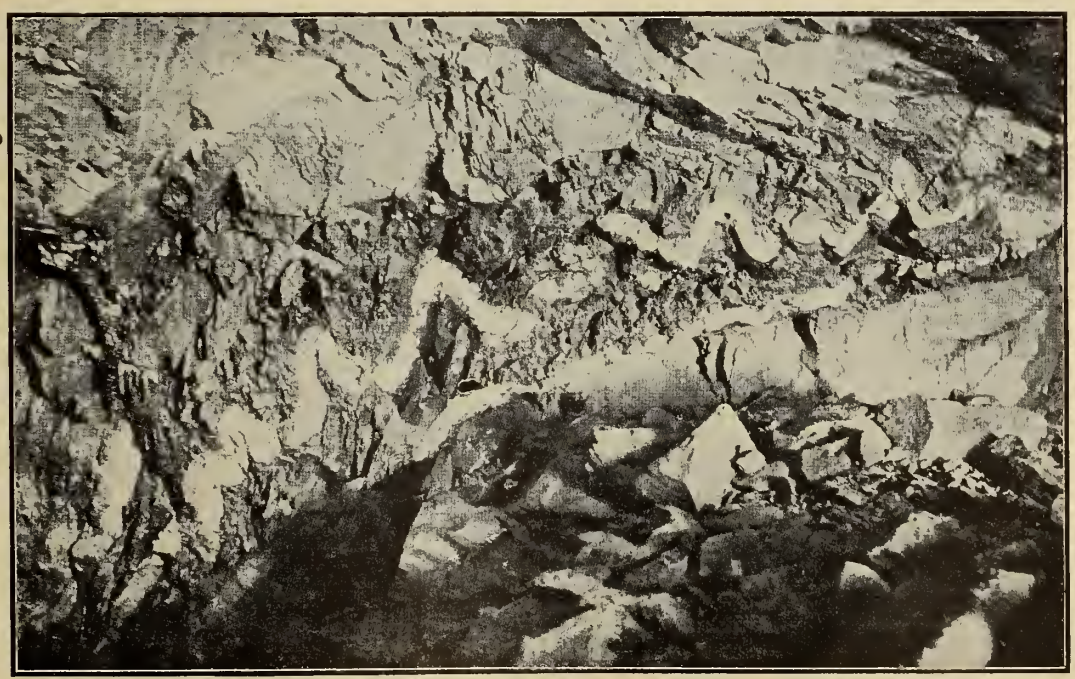
(Continued from last issue.)

Origin of the Crenulation.

The origin of this beautiful structure is difficult to explain. The first idea, adopted by some of the early observers, is that the quartz constitutes an integral member of the sedimentary series, that is, the silica that became quartz was deposited contemporaneously with the silt and sand that became slate and quartzite. According to this theory, the quartz underwent folding and corrugation with the encasing rock, and was particularly plicated at the places where anticlinal movements crossed. This simple explanation is killed by the single fact that the crenulated veins cut across the bedding-planes between the slate and quartzite. (See photograph No. 1.)

The next theory that may be proffered is that the quartz has replaced another mineral, segregated from the original sediment and distributed along bedding-planes or other lines affording passage to underground solutions. Calcite is prevalent throughout the region, and in association with the quartz; therefore it may have occupied the fractures in which quartz is now found. Such calcite would have been crushed by the earth-movements, and thus it would be all the more easily soluable in silicious acid waters. This theory also lacks the support of evidence. It is true that although we cannot conceive a layer of quartz undergoing violent bending without becoming crushed, a condition in which quartz is not uncommonly found in lodes,* we can imagine more readily that calcite could better withstand the strain, and even if crushed it might, at a later period, be replaced by quartz. In this connection we may remind ourselves, on the testimony of natural sections, that rock deformation ensues in the deeper portion of the earth's crust. C. R. Van Hise has estimated that at 12,000 metres "the weight of the superincumbent mass is greater than the ultimate strength of the rocks,† which then undergo "flowage" or deformation without fracture." These considerations might well apply to the case in point, for, as we have seen, the rocks encasing the gold-bearing quartz now being mined in Nova Scotia were at one time covered by eight miles, or 42,000 feet, of superincumbent strata. Moreover, the practical researches of Frank D. Adams, in the laboratory of McGill University, prove that many rocks and minerals are capable of deformation without rupture when under great pressure.‡ Thus we have evidence on this point; but it is not applicable to our problem. If it be supposed that the quartz replaced another mineral which was deposited along the bedding-planes, either by original sedimentation or by subsequent segregation, we are again faced by the fact that the crenulated veins traverse the bedding. Hence they could not so originate. If we recognize that the quartz does not lie wholly along the planes of bedding, then the problem of explaining the crenulated structure is not facilitated by imagining quartz to have replaced calcite for any explanation that would suffice for one would be adequate for the other. Therefore this second theory does not carry us any further forward. We dismiss it, with regret.

The next theory is not so easily stated, but it is based on the observation that quartz veins exhibit a step-like or zigzag course in traversing beds of diverse texture and in crossing the cleavage, joints, or other structural inequalities of a homogeneous rock. Thus, at Bendigo, I noticed that the "spurs" or cross-veins, which are mined profitably on a large scale, have a marked characteristic: they cross the sandstone almost



198 **No. 1—The Borden Vein in the West-Lake Mine at Mount Uniake.**

A paper to be discussed at a meeting of the Institution of Mining and Metallgury, to be held in the Rooms of the Geological Society, Burlington House Picadilly, W., on Thursday, April 18th, 1912, at 8 O'Clock p.m., and presented at a meeting of the Canadian Mining Institute, at Toronto, on March 6th, 1912.

*I refer to the excellent maps prepared by E, R. Faribault for the Geological Survey of Canada.

*Such as the Comstock.

†Trans. Amer. Inst Min. Eng., Vol. xxx., page 32.

‡The Journal of Geology, vol. xviii., No. 6. "An Experimental Investigation into the action of differential pressure on certain minerals and rocks." By Frank D. Adams.

at right angles to the bedding, but they tend to follow the cleavage of the slate. Fig. K reproduces Fig. 31 of my Bendiga paper. On turning to the description, written in 1892, I find that I referred to this characteristic in the following words: "A quartz seam upon leaving a bed of sandstone and entering one of slate, invariably turns its dip in sympathy with the cleavage of the slate." To put it in another way: a fracture crossing a series of slate and sandstone (or quartzite) beds will cut right across the sandstone because it is of fairly uniform texture, so that it is as easily broken one way as another. The same fracture, when encountering a fissile rock, like slate, will find the path of least resistance along the cleavage rather than across it. Hence the fracture, in crossing an alternation of such rocks, will take a step-like or zigzag course. See Fig. L).

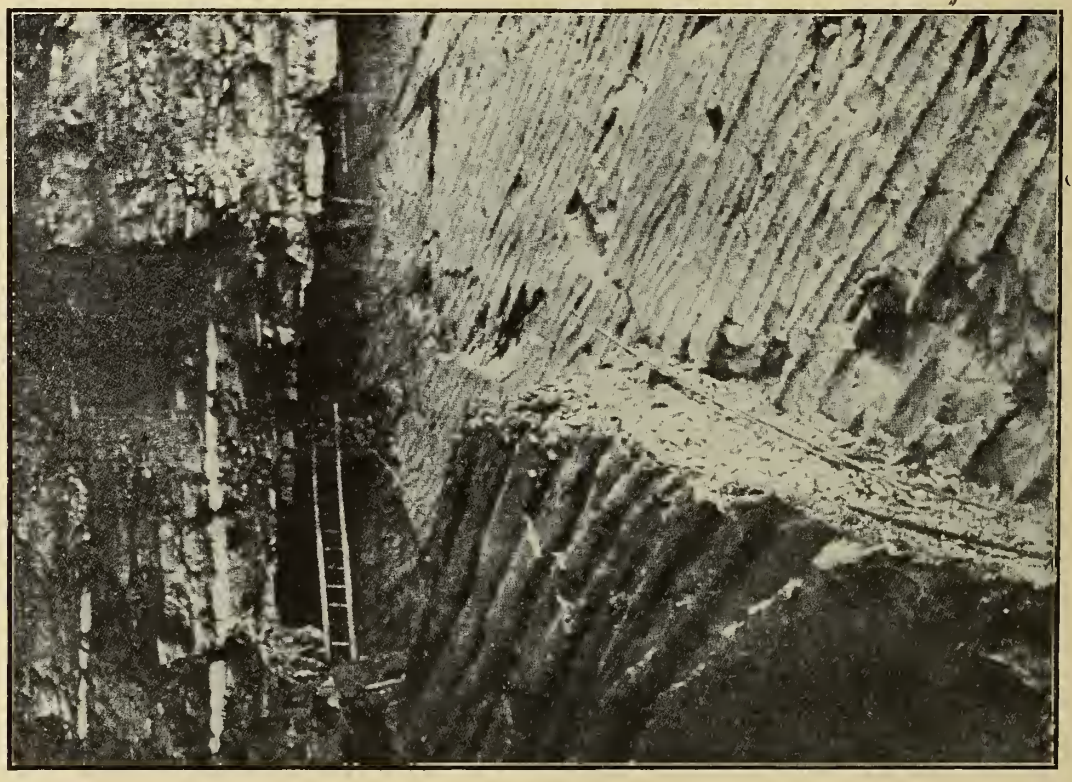
If, now, the beds be thin we find this structure emphasized.

If, next, we suppose the alternation to be repeated with greater frequency—if, in other words, we take a shaley sandstone marked by well-developed cleavage —we obtain conditions favourable to a crinkly line of fracture. (See Fig. N.)

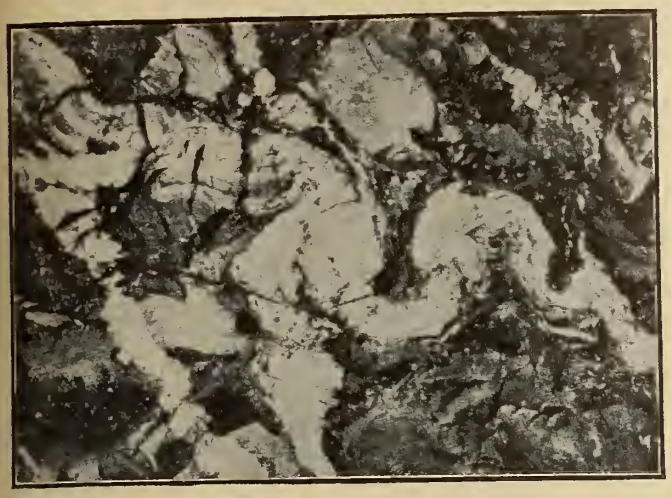
This affords a clue, which appears to be confirmed by the significant fact that the crenulation, as seen in the Nova Scotian mines, has a pitch conforming to the line of intersection between the bedding and the cleavage. It appears to be dependent on a relation to the cleavage.

Crenulation is not unknown at Bendigo, although there it is not a dominant characteristic. On turning to my first paper on the Bendigo goldfield (Trans. A.I.M.E., vol. xx.) I find two sketches, Figs. 65 and 66, illustrating this structure. Fig. O reproduces the Fig. 65 just mentioned; it is particularly interesting because it shows that the deposition of quartz has followed, not only the lines sympathetic to the bedding, but also a nearly vertical fracture along the anticlinal cleavage. We must remember that the shape of the quartz is determined by the nature of the receptacle that it occupies; even if we suppose it to have found space by replacement of portions of the country-rock, we have to ascertain the nature and shape of the fractures along which it found a way when in solution. Veins of quartz vary in dimension and direction in accordance with the diverse texture and hardness of the rocks traversed by fractures precedent to ore deposition.

These fractures are various. The lines of weakness along the bedding-planes, especially such as separate a relatively soft from a relatively hard rock, a slate from a quartzite, for example, furnish obvious facility for rupture. Along these is deposited the quartz of the ordinary saddle-vein. Other things being equal, the crest of an anticline furnishes an opening or a tendency to open; the syncline does this also, but, while the principle of the arch tends to keep the anticlinal fracture open, the dead weight of a trough-like depression or syncline tends to close it. Between the two bends, on the flanks of the anticline—which are also the reversed flanks of the syncline—the strata are compressed, the bedding-planes are tight, and the least possible facility is afforded for the circulation of underground waters. Connection between the crests of the anticlines is obtained by fractures that follow the anticlinal axis, as in Nova Scotia, or by dikes that have been injected in the wake of regional dislocation, as at Bendigo.



No. 2.—Crenulated foot wall in open cut at Mount Uniake.



No. 3—The Richardson Vein with cross-stringers.

In a region marked by folding the greatest intensity of fracturing is exhibited at the place of maximum plication. At Bendigo this is found at the apex of an anticline. In Nova Scotia it is found where the folds intersect, that is, where an anticline plunges in obedience to a transverse syncline: at the nose of a dome. It is there that the crenulation is most marked. Folding is accompanied by cleavage in fissile rocks and by jointing in those of granular texture. The main anticlinal axes are characterized by a dominant cleavage, usually at a high and persistent angle. At the approach to the apex of the fold, and more especially at the place where the rock is twisted by cross-folds, the regional cleavage is dominated by a local radial fissility, exemplified in several of the annexed photographs. It is there that the crenulation is most marked and most continuous.

At the place of maximum flexure, where the cleavage dominates the bedding, any fracture due to regional movement will find a devious way. In part it follows the bedding, or, at least, it confines its divagation to one soft bed—of slate; in part, it responds to the invitation of the cleavage-lines. in default of such assistance it traverses both bedding and cleavage, but not for long. A vein-fracture in one mine plays many parts. That was the lesson at Bendigo; that is the teaching of Nova Scotia.

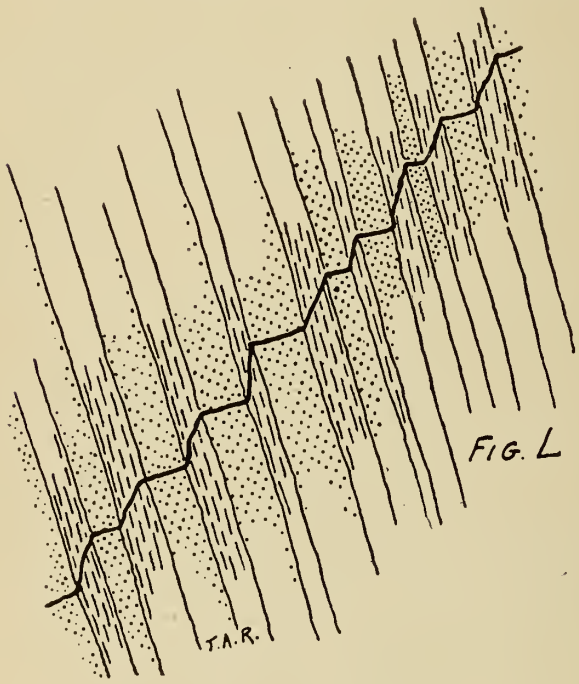
When the solutions containing both quartz and gold began to course along the fractures thus prepared, they were deposited wherever conditions were favourable, and after deposition they tended to reproduce the character of their abiding place. Thus I argue that they were precipitated along the bedding-planes, to form the simply tabular deposits that delight the writers of textbooks; they likewise were laid down along the arches that gave us the symmetrical saddle-lode; they rested in cross-fractures that became the "spurs" of Bendigo and the "angulars" of Nova Scotia; and, finally, they found a way into the intricate and rhythmically-crinkled passages prepared for them, where cleavage and bedding disputed for structural mastery.

As far as I know, only one writer has made a detailed study of the crenulation. I refer to Mr. J. Edmund Woodman, formerly Professor of Geology in the Dalhousie University, at Halifax. His paper on the Moose River district, to which reference has previously been made, is a good example of careful investigation. The accompanying drawings are excellent. They afford evidence that the crenulation is usually confined to one side of a fold, that it is found on cross-veins as well as on the stratified veins, that the laminae of the enclosing slate tend to curve with the quartz, that the crenulation is most common in slate beds bounded on both sides by quartzite, that the sympathetic curves in the rock rarely reach more than 2 feet from the crenulated vein, and that the furrows are larger where not parallel to the bedding. He recognizes strain-slip cleavage, and says that "if it caused the corrugations, we should find some sign of it also in the sediments, either cleavage or acute small-scale folding; but do not." He adds that "there is not the slightest deviation in the dip of the laminae in proximity to the veins," but I cannot reconcile this with the statement that "the lamination of the slates follows the crenulations of the lead, exactly when near it, less faithfully when farther away. If the "deviation" of the laminae is not from the normal dip, from what line is the deviation? Dismissing strain-slip cleavage, Mr. Woodman says: "The only explanation remaining, therefore, is that the cross-veins lie in fissures which had their present sinuous course at the beginning of occupancy by the vein material. It is noticeable that this crenulation is not found in quartzite unmixed with slate; but is confined to slate and alternations of the two. It is best developed where no quartzite is present. It appears, then, that in the thinly laminated pelites,* at the time of intrusion of the cross-veins, the rock broke under the strain most easily across the strata squarely or diagonally in places, with the bedding in others, and in some backward or downward rather than upward. Thus I infer that Mr. Woodman and I reach the same conclusion by diverse ways. I had not read the foregoing paragraph until after arriving at my own conclusion. And I reached it by two suggestions: first, the coincidence between the pitch of the crenulation and the line of intersection between the planes of cleavage and bedding, as noted by me in 1905, and, secondly, the analogy of the cross-veins as sketched by me at Bendigo in 1890, showing the zigzag structure when the quartz-filled fracture crosses alternate beds of slate and sandstone. On turning to Mr. Woodman's paper I noted his sketches of cross-veins accompanied by crenulation, but it was not until writing the foregoing paragraphs that I ascertained how closely his conclusion tallied with my own. We express it differently, but the fundamental idea is nearly identical. He wrote in 1903.

Thus the crenulation may finally be regarded as the beautiful product of complex fracture due to cross-folds in rocks of uneven texture. The fissility induced by extreme plication has afforded a sinuous line of passage to rupture and to the quartz that subsequently healed the rupture. As originally formed the veins were crooked, that is, they zigzagged in a sharply angular line. In the course of mineral impregnation they became rounded. Nature hates an angle as she abhors a vacuum. Time softens hard lines is a poetic way of saying that chemical corrosion is most rapid where the largest surface is exposed to solvent action. The angles of the zigzag vein-fracture were filled with quartz, which, in the course of accretion from further passing solutions, replaced the crushed slate adjacent

*A pelite is a rock composed of fine mud.

to it and slowly gained a rounded outline. On the 700-foot level in the Gagnon mine, at Butte, I have seen boulders 5 or 6 feet in diameter, formed by the solvent action of water that has seeped along joint-planes in the granite. These were similar in origin to the boulders formed by erosion at surface, and were due to the sculpturing hand of chemical waters. Once rounded, the hard quartz bent the neighbouring soft slate to its unyielding shape. Neither movement nor solution cease underground at a given moment. Since the veins were formed, the continual shifting of loads of sediment, by transfer from mountain to river, from



land to sea, has caused the disturbance of equilibrium that incites geologic unrest. This has been the cause of new fractures along which later solutions have found a patient way. Photograph No. 3 shows clearly the occurrence of quartz veins differing in character and origin. We who see a vein in a mine to-day are apt to regard it as a finished product, brought to our attention at the close of a completed cycle of chemical and physical operations. We regard ourselves as full-stops in time. On the contrary, the whole of the period during which man has tenanted the earth barely

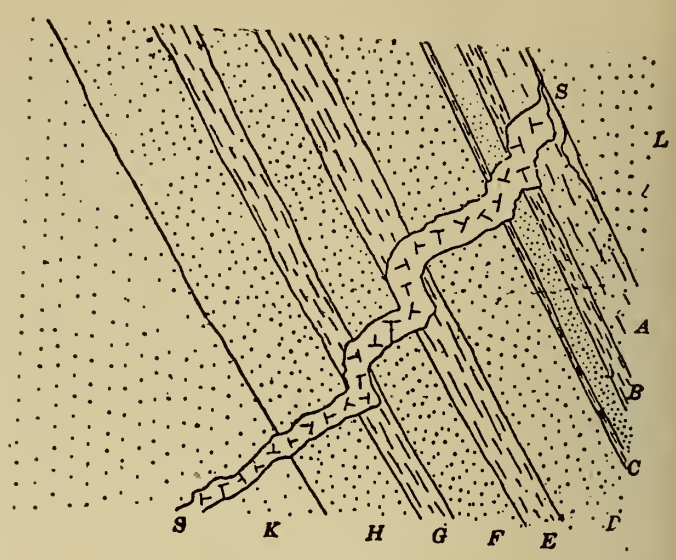
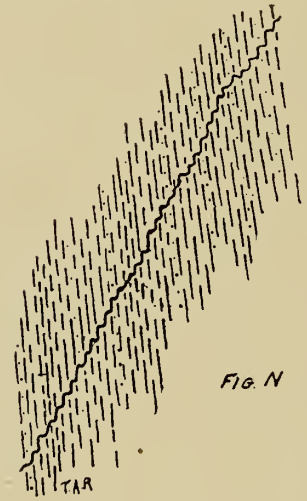


FIG. K.

punctuates the geologic record; ours is a brief phase synchronizing with a minute portion of the vast stretch of time during which the vein of ore has undergone successive change. Had we left it in the ground it would have undergone, in later eons, a further alteration. When we remove it with the pick and hammer we break the normal sequence of its development; we are for a brief moment the masters of forces that have operated since the dawn of creation.



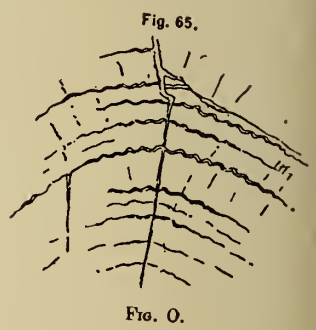


FIG. O.

THE INFLUENCE OF SMELTING, ELECTRICITY, AND THE CYANIDE PROCESS ON MEXICAN SILVER MINING

From the Bulletin of the Mexican Institute of Mining and Metallurgy.

By Victor M. Braschi, E.M., C.E.

Twenty years ago the bulk of Mexican silver ores was treated by the Patio process, but attempts were made often to introduce the American pan system with very little success owing to any of the three following causes:

No. 1. Non-adaptability of the ore;

No. 2. Irregular supply of ore, and

No. 3. Lack of knowledge of mechanics and of pan mill practice.

In mining the methods were still of the primitive type, the only machine which had been accepted generally being the steam hoist. Pumping was done preferably by hoists, the old horse malacate and ox hide bag in the lead, the ox hide bucket making it flexible

and easily filled vessel. Steam pumps were a nuisance, expensive to install and to run, and the lack of mechanical knowledge and the heat developed under ground made them a troublesome and very unsatisfactory contrivance. The only successful steam pump in use at that time was the good old Cornish pump which was the favourite in Pachuca in the hands of Cornish miners, but practically the methods described by our worthy President in his Centennial address were in full blast. Expensive fuel and consequently expensive power being one of the greatest drawbacks to development.

At about the same time the American Secretary of the Treasury ruled that lead ores should pay a duty when imported into the United States, and at once this gentleman laid the foundation of the smelting industry in Mexico, as you all know.

Roughly and generally speaking we may say that in the well established mining camps of those times, like Pachuca, Guanajuato, Zacatecas, etc., the expense for mining and treating a ton of ore was about $15.00 each, so that ores assaying less than one kilogram of silver could not be treated, especially as the major portion of the gold was lost. Let us remember, also, that the general average of time required for a torta was thirty days, so we can see, therefore, that the mining interests of Mexico were well prepared for the inducements which the smelter made to them.

The smelter not only paid for the ore on delivery, but it even advanced money to the mines, and it also paid for the gold contents, until then mostly wasted, and the matter of a high charge for freight and treatment was easily lost sight of by the miner on account of his being put in funds promptly and of being paid for a larger average extraction than the Patio process yielded. It is also a matter of history that the smelters prepared their ground very carefully by getting the railroads to make long time contracts for ore haulage at low freight rates at practically cost to the railroad, with the argument that the tonnage would benefit the railroad indirectly by the long haul and by the general industrial growth of the country, but the miner did not receive the benefit of the low freight rate, either.

Gradually the Patio process began to go out of existence and no more attempts were made to develop any other different metallurgical process since all ores gravitated to the smelter, until the mining industry awoke to the fact that the profit was all going to the smelter and a period of stagnation in mining set in. The Mexican owners of mining properties sold them readily to the smelters and to foreign corporations and the old spirit of the native Mexican miner began to die out. The Mexican capitalist also devoted his wealth to speculation in banking and industrial shares, real estate, etc., so that mining began to be looked upon askance.

The railroads also complained of the non-profitable haul on ores and endeavored to have the freight rates changed in their favour.

But the smelter waxed so fat that it formed the natural monopoly under such circumstances, accumulating large reserves of cash, paying large dividends and buying and leasing and controlling large mining properties.

The smelter began by helping the Mexican mining industry, but it was ending by throttling its very life. There was no incentive to the prospector nor to the independent outside investor. The whole commercial activity of the various mining districts was dying out and the Mexican mining industry was giving evident signs of becoming soon simply a series of large mines controlled by the smelting interests and a few independent large companies. And things went even further, since the Government of Mexico and her most influential surrounding business groups began to lean to the idea that the mining industry partook too much of a gambling proposition which tended to demoralize the good substantial business principles of the country and that it would be a very proper thing if the commercial energies of the nation and its wealth should be turned into other channels, so that the Mexican silver industry was indeed facing many dangers.

At this writing the whole country is well satisfied with the results achieved by the law of monetary reform which has given the country a stable currency and at the same time kept for the country's exports the great benefit of a high rate of exchange, which also was made stable. Results have confirmed the wisdom of this monetary law, but mining men considered then and consider now that the law did not go far enough as the taxation upon silver mining was kept still at a high figure, collected upon the gross output, an inheritance of the times of the "King's fifth."

It was most fortunate for Mexico and her chief industry, silver mining, that just as the new monetary law went into effect the price of silver went up and the Mexican silver dollar could be exported at a profit, which lucky circumstance happened at the very time that the silver miner had the opportunity to convert his wasteful and expensive antiquated methods into modern, efficient and economical processes.

The historic old mining camp of Guanajuato deserves the credit of having been the cradle of the new epoch. It is true that the cyanide process as applied to silver was first tried in the State of Sonora, but it was Guanajuato that made it generally known upon a large and suitable scale. It was Guanajuato, also, practically a dead and abandoned mining camp, which because it had produced so largely and contained such well-formed mineral veins with mines containing considerable amounts of low grade ore and valuable dumps, induced a group of American capitalists to develop electrically a water power in the State of Michoacan and graphically blazed a way to point out to the silver miner what he could accomplish with cheap power and a cheap metallurgical method. It is true that this was not the first electric transmission hydraulic plant installed in Mexico, as I believe that honour belongs to the Regla Company, but it was the epoch maker.

Cheap electrical power at once gave the miner the convenient electric hoist and electric pump, not to speak of course of the cheap power for his cyanide mill.

It is unnecessary to go into descriptions at the present time of the improvements made in electrically driven machinery, but I will say that Mexico has been the field where many of the successful machines of to-day were either developed to the fullest extent in their application or even were first tried. We are all familiar with the rapid development of the Pachuca tank; it was in Mexico where the Johnston concentrator made its first success, and it was in Mexico where the very first Aldrich electric pump manufactured was set up. Some of us remember the days of the old steam pump when no pump was satisfactory and if somebody had bought one make he wished he had bought another one.

so that the miner was easily inclined to give up the expensive and annoying steam pumping plant and have recourse again to the expensive but satisfactory and reliable hoist with its positively up and down moving bucket. The sinking of shafts in those days was a laborious and unsatisfactory job, so the miner was constantly tempted to forget the good basic principle of keeping the bottom of the shaft always below his stopes, and he went back readily to the plan of his forefathers of keeping the bottom of the shaft over his stoping head.

During the period of transition the smelter still enjoyed the troubles of the miner because the abundance of silver ore in this country is so phenomenal that if the ore did not come from one camp it was bound to come from another.

I well remember the time when every mining camp was a bee-hive of freight and commercial activity because the ore was mined and treated at each mine or at each mining camp and pay rolls of mines and mills kept commerce alive locally. But gradually the high roads ceased to see the string of freighters. Slowly the Patio mills began to shut up their gigantic doors. The arrastras stopped grinding, the mules were sold to the farmer or to the street car company, houses were abandoned, doors closed, and mining camps began to look like deserted cities, but the smelter kept on gathering the piles of ore and sending the profits all abroad.

With the cyanide process mines can not only treat the newly developed low grade ore profitably, but they can go back to the old rotting stopes and to the fills and dumps and make them yield a silver stream with a golden lining. Each mine capable of producing regularly from 50 tons of ore a day up can at once begin to treat its own ores. Every mining camp has begun filling up and the good old buildings of the Patio mills are opening up their hospitable doors to the new machinery, the names of which I will not mention so as to avoid any feelings of jealousy. Every mining camp is again becoming a centre of commercial, metallurgical and mining life and the silver industry is coming back into its very own now that the twenty year period of the smelter tyranny has come to an end.

But more than that—the Mexican miner, always full of hope, always having a keen eye for a prospect, and the Mexican capitalist have both jumped back into the ring with both feet and we hear nothing more of the "caracter aleatorio" of mining, but on the contrary banks and bankers are doing their share to promote the modern business of Mexican silver mining.

A great deal has to be done yet—besides a revision of the system of taxation on silver we need here in this country a modern, up-to-date mining school and the training given to young mining engineers will be of vast use to Mexico in developing some of her other industrial needs. Copper and iron ore are being mined by steam shovels; cement rock and phosphate rock belong to the crust of the earth just as much as does silver quartz. The young engineer might just as well work in a cement mill as in a copper smelter; as well in a fertilizer plant as in a quartz mill. Modern Technical education will fit the young man as well for one as for the other. Mining in a sense is manufacturing—productive mining certainly is. Many people think that mining is simply the preliminary part or unprofitable part whilst you are looking for something until you find it, but it is not mining alone that requires the investment of capital in the stages of investigation and research. Mining has always been one of the great businesses of the world and always will be.

COAL LANDS IN NORTHERN CARIBOO, B.C.

Mr. C. F. J. Galloway, mining engineer, of Vancouver, B.C., has made the following preliminary report on coal lands in Northern Cariboo, B.C., to Mr. A. E. Hepburn, also of Vancouver:

"Your coal area on Bear River is situated about 50 miles above the mouth of the river, being about 45 miles due east from Fort George. A good trail exists from Fort George eastwards to Willow River, a distance of 26 miles; from there a trail about 22 miles long would reach the property.

"The best way to reach it with a trail or road, however, would be from a point on the upper Fraser River, above the canyon, which is only 15 or 16 miles distant, the pass separating the two valleys being low. As the Grand Trunk Pacific Railway will have steel laid to Tete Jaune Cache, and small steamers running on the upper Fraser River, next spring, it will be easy to get supplies and materials in this way.

"The area consists of 15 full sections covered by coal prospecting licenses; of these, three may profitably be dropped. The exposures of coal measures are few, and are confined to the banks of the river, following more or less the line of strike, so that the extension of the measures to the dip can only be assumed from the configuration of the ground, the limits being fixed by exposures of igneous rock. There is every reason to believe that the coal measures underlie the whole of the flat area between the hills of igneous and other rock, but allowing a large margin for disturbed and unproductive areas ,a very conservative preliminary estimate of the area underlain by coal measures would be 4,000 acres. The recent survey of the area has shown that some of the sections extend on to the hills of igneous rock. My estimate of the productive area is, therefore, considerably less than that given on previous occassions, being, moreover, intended as a rough estimate of the minimum probable productive area included in 12 sections only.

"Three workable seams of excellent bituminous coal have so far been proved, with an aggregate thickness of rather more than 21 feet, plus an unknown amount up to 4 feet, for the top of the upper seam, which was not visible above drainage level at the time of our visit. Numerous smaller seams are visible, and some of these will very likely prove workable under portions of the area. It is also quite likely that other seams occur, which are not seen at all in the few exposures.

"Taking a thickness of 21 feet over an area of 4,000 acres, at the rate of 1,200 tons per foot per acre, which allows amply for all losses in working, faulty ground, etc., there would be 100,800,000 tons of coal included. This figure is not given so much as an actual estimate of the quantity available, as to show that even taking

the minimum probable conditions as to area of measures and thickness of coal, the property is of enormous value.

"Where the coal is seen, the measures are standing at an angle varying from 20 to 45 degrees, but the indications point to a flattening toward the dip, so that the coal may be expected to underlie the greater part of the area at a comparatively small depth.

"The depth and extent of the coal should be proved by diamond drill holes at several points before any permanent opening is done, but, if it be desired to work a small output without further delay, a temporary shaft could be sunk on the northeast side (right bank), of the river, opposite to, and not very far from, the coal exposure which has been opened. If this be not done, I should recommend the driving of a cross-cut on the same side of the river as the present tunnel, but at a slightly higher elevation, to prove the ground below the three known workable seams.

"As we had to abandon our boats coming out, it was unfortunately necessary for me to leave all my samples behind, to be brought out later, but the analyses you already have prove the excellent quality of the coal. One of these analyses, by Mr. J. O'Sullivan, of Vancouver, B.C., of a sample of the thickest of the three seams referred to, is as follows:

	Per Cent.
Hygroscopic water	3.5
Volatile combustible matter	41.5
Fixed carbon	50.0
Ash	4.0
Sulphur	1.0

Coke, 54.5 per cent.

Character of coke, hard and firm.

Heating power in British thermal units, 12,517.2.

Pounds of water evaporated by one pound of coal, 12.95.

"The seams are to some extent interbedded with bands of shale, but this will easily be removed by a modern washery.

"As this is the only coal, other than lignite, yet known in central British Columbia, it will find a ready market in the Grand Trunk Pacific, and other railways which will soon be built through that country, which is now attracting so much attention. Timber is scarce in many places, and the coal will have a considerable market for household and industrial purposes in Fort length, over the pass already referred to, will connect George and other places.

"A short railway or tramway, 15 or 16 miles in the coal area with the Grand Trunk Pacific Railway, or, one of 8 or 10 miles across an equally easy pass to the west, would connect it with the Willow River & Barkerville Railway, which, it is expected, will be constructed shortly, so that once railway communication is in the country, the question of shipping facilities will be very easily solved."

MINING IN BRITISH COLUMBIA IN 1911

In the course of an address to the Legislative Assembly of British Columbia, the Premier of the province, Hon. Richard McBride, who is also Minister of Mines, said:

"Perhaps as Minister of Mines, I should say something at this juncture with regard to the progress made by the mining industry of this province during the year just past. Mining generally held its own in 1911. The older properties made about the output expected of them, and a few new properties advanced to such a position as to ensure a substantial production in the future, such as the Britannia mine on Howe Sound, and the Granby Company's Hidden Creek mine on Observatory Inlet, while in the Slocan several properties have developed ore of such quality and in such quantity as to give hope that the palmy days of that district are by no means past—even the hills there have a silver lining.

"Statistics of the year's production are not yet complete, but an estimate by the Provincial Mineralogist leads us to expect a production of about $5,187,000 in gold, $946,000 in silver, $1,161,000 in lead, $4,432,000 in copper ,and $127,000 in zinc, or a total production of metalliferous minerals amounting to $11,853,000; of coal an estimated production of $8,523,000; of coke, $465,000, and of miscellaneous minerals (building materials, etc.), $2,000,000, giving a total valuation of the output for 1911 of $22,841,000, which total is approximately $3,500,000 less than was that of 1910.

"Each of the minerals mentioned, except miscellaneous minerals, shows a considerable decrease as compared with last year, which does not appear consistent with my previous remarks relative to the general advancement made by the province, and would not be were the position not capable of being explained. The chief reason for these decreases is to be found in the fact that labour troubles caused the shutting down of the Crow's Nest coal mines and coke-making plants for a period of about eight months out of the year. This entailed directly a loss in output of coal and coke of more than $2,120,000, and indirectly (through cutting off the coke supply, thereby causing suspension of work at the Granby Company's mines and smeltery in the Boundary district), of a considerable proportion of the losses shown in gold and copper and part of the decrease in silver. A remaining portion of the decrease in silver, and as well that in zinc, is attributable to the destruction by forest fire in the summer of 1910, of part of the Kaslo & Slocan Railway, thereby cutting off transportation facilities, and the burning of mine and mill buildings and plant.

"With regard to the regrettable labour difficulies, I have referred to, I sincerely hope that we shall ere long find some machinery which will operate successfully and without injustice to any, by which such deplorable industrial disturbances may be avoided. I do not propose to enter into any discussion of the ethics of strikes. It is perhaps true that the right to strike constitutes the greatest protection which the working man enjoys; but when one goes through a district in which a strike is taking place he cannot but feel the pity of it all. It is, of course, disastrous to the interests directly concerned and to the business of the country, but how much worse for the men who are deprived of their opportunity of earning a livelihood for themselves and those dependent upon them, and how much worse still for their faithful wives and their little chil-

dren. It is too bad that the genius of man has not yet been able to devise some means by which these most deplorable crises may be averted.

Wonderful Deposits of Coal.

"The outlook for the metalliferous mines of British Columbia is encouraging, and if we shall get a year free from labour troubles, the output of the East Kootenay, Slocan, Nelson, Rossland, Boundary, and Similkameen mines should show an increase in gold, silver and lead, while the Coast mines should increase the production of copper.

"At present our coal mines produce about half of our total mineral output in value. And it would seem from the development of the past year as though we had only touched the margin of our wonderful coal deposits. The year's developments include new and great coal fields in East Kootenay, other new and important deposits in the Similkameen, and last, but probably the greatest, is the determination of what promises to be the greatest anthracite or semi-anthracite field west of Pennsylvania, at the head waters of the Skeena River. This last-mentioned field is as yet but little developed, but if only a fraction of present promise shall be fulfilled, it will be bound to have a wonderfully stimulative effect upon the future of the province. The coal mines of Great Britain gave it its position as the manufacturing centre of the world, and our coal fields unquestionably will serve as a strong magnet to draw the manufacturing interests of the Pacific to our shores. Coal is a breeder of industries and its value to the country does not by any means end with its having been disposed of by the companies engaged in mining it.

"Before I conclude my remarks, it will not be uninteresting to have mentioned to you that the coal mines legislation enacted during the last two years (this including the provision for mine-rescue work in 1910), has been working well. And, before sitting down, I might announce to the House that the office of Chief Inspector of Mines, vacated by Mr. F. H. Shepherd, now representing Nanaimo District in the House of Commons, was filled at the first of this year by the appointment of Mr. Thomas Graham, of Nanaimo, an appointment which I am sure will prove of distinct advantage to the mining industry and to the province."

As supplementary to the foregoing, our correspondent, Mr. E. J. Jacobs, Victoria, B. C., has supplied the following approximate estimate of the mineral production of British Columbia for the calendar year 1911. In this connection he observes: "The accompanying estimate differs somewhat from other estimates I have recently sent out for publication, but as the latter were necessarily based upon returns in which production in November and December months was estimated, while now the actual production in a number of instances is known, it follows that changes have had to be made accordingly.

Approximate Estimate of Mineral Production.

Gold, placer		$ 470,000
Gold, lode, 230,000 oz.		4,754,100
Total gold		$ 5,224,100
Silver, 1,900,000 oz.		962,077
Lead, 29,000,000 lbs.		1,153,620
Copper, 35,500,000 lbs.		4,393,480
Zinc, 2,600,000 lbs.		127,270
Total metallic minerals		$11,860,547
Coal, 2,450,000 long tons	$8,575,000	
Coke, 66,000 tons	396,000	
Other materials (stone, brick, lime, cement, etc.)	2,000,000	
Total non-metallic minerals		$10,971,000
Total value of mineral production		$22,831,547

As compared with the production of 1910, the foregoing shows a gross decrease in metallic minerals and coal and coke, of $4,045,519, but as there was an estimated increase in building materials of $500,000, the net decrease in the production of the year is estimated at $3,545,519.

JOURNAL OF THE CANADIAN MINING INSTITUTE.

The Journal of the Canadian Mining Institute for 1911, which is Vol. XIV., has been issued. It is a credit to the Institute, and compares favourably with corresponding publications of older and larger mining and metallurgical institutions, in respect of number of, general standard of the papers contained, and decidedly so in the comprehensive and most useful index compiled by the secretary, Mr. H. Mortimer-Lamb, who took infinite pains to make this almost indispensable adjunct to an excellent work the more serviceable to its readers.

Of the more noteworthy of the papers included in this volume, several may be mentioned, namely, those of Dr. James Douglas, on "Earthquakes in Mines", Mr. J. S. Diller, on "The Types and Modes of Occurrence of Asbestos in the United States"; Mr. E. B. Wilson, "Some Notes on Pyrite and Marcasite"; Dr. Heinrich Ries, on "The Clay and Shale Deposits of the Western Provinces of Canada"; Mr. J. D. Irving, on "Some Features of Replacement of Ore-bodies and the Criteria by Means of Which They May be Recognized"; Mr. W. R. Ingalls, on "The Problem of Mixed Sulphide Ores"; and—among those of the Canadian members—Mr. D. B. Dowling, on "The Undeveloped Coal Resources of Canada."

The reports of the 1911 annual meeting, held in the city of Quebec, and of meetings of branches of the Institute, will doubtless prove of interest to members generally, who will also appreciate an improvement in quality and style of binding, the latter admitting of the book lying quite flat when open. Altogether, Vol XIV. will be a welcome addition to many libraries.

DUTY OF GRINDING PANS.

The average duty of a 5-foot grinding pan is about 20 tons a day as a stage-grinder, or about 9 tons a day as a slimer, and the power consumption is about 6 horse-power. In the Kalgoorlie field the Wheeler pan is in general use, but not so on other fields. At the Ivanhoe mine elaborate tests were made some years ago as to the relative value of the pans and tube-mills, and these tests came out in this particular case in favour of the pans.

VERTICAL VERSUS INCLINE SHAFTS IN PRECIOUS METAL MINING*

By John Malcolm Nicol.

There is still a great diversity of opinion as to the relative merits of inclined and vertical shafts; hence, the excuse for these notes is not so much to give an account of my experience, or to state my own opinion regarding the matter, as to sum up and analyze some of the generally accepted ideas, so as to obtain a generous discussion of the whole subject from other members of the profession, thus enabling us to hear the most recent experience and advanced opinions of engineers in Mexico.

A three or four compartment inclined shaft sunk on the vein was almost universal practice in California for a great number of years, and we may still find some notable examples of four compartment inclined shafts with only two hoisting compartments through which from three to five hundred tons of ore is handled with self dumping skips every 24 hours, from depths of 2,000 to 3,000 feet, on the incline and even over. In South Africa I understand the tendency has been to change from vertical to inclined shafts, and also to the use of combination shafts; while here in Mexico the inclined shaft has been almost exclusively used for exploration purposes and ladderways, the main hoisting and unwatering shafts being nearly all vertical.

Thes ubject may be considered from various points of view: first, as to the primary purpose of the shaft and the relationship of the surface topography to the dip of the vein and other local conditions; secondly, as to the cost of sinking, and subsequent cost of extraction per ton; and, thirdly, as to the intrinsic advantages or disadvantages of either type of shaft, per se, in relation to any of the factors coming under the above heads.

No final rule can be laid down inasmuch as numerous local conditions, such as an excess of water in either wall of the vein as against comparatively dry ground on the other side, the stability of the different walls, and such factors, often finally control the location and type of shaft. I have, therefore, dealt with the subject from a broad standpoint, and rather from a consideration of the merits or demerits of the vertical or inclined shaft "per se."

I find that in Mexico there is a very general prejudice against the inclined shaft, and the idea seems to prevail that it cannot be sunk as rapidly and economically as a vertical shaft, and that ore extraction and other mining operations in the course of the development of a mine cannot be carried on as conveniently and economically through an inclined as through a vertical shaft.

The purpose for which shafts are sunk in precious metal mining may conveniently be considered under four heads.

1. Those sunk to locate a body of ore in an unexplored vein: that is "prospecting shafts."

2. Those sunk for the express purpose of draining a given zone, either virgin or comprising old workings.

3. Those sunk for the economic development and extraction of a known or assumed body of ore.

4. Those sunk exclusively for ventilation, or for providing additional means of egress from the workings for purposes of safety, etc.

It frequently occurs that nearly all the above requirements are covered by one shaft, yet the classification will be found I think, convenient for purposes of reference.

Dealing with the first division, "exploration shafts," and assuming that the topography and the dip of the vein are such that either an inclined or a vertical shaft could be sunk, I believe it is generally considered that the inclined shaft is preferable, especially for exploring an undeveloped zone in a district that has not been proved at depth by other mines in the neighbourhood.

The advantages generally claimed by sinking on the vein with an incline are the following:

(1) That the vein can be followed however much it changes, and no long cross-cuts are needed to reach the ore for extraction purposes.

(2) That, when the first exploration shaft that is sunk on an out-cropping rich ore shoot is inclined and follows the ore, the ore extracted will often pay expenses; hence, the maximum of exploration is accomplished with the minimum of expediture.

(3) That, owing to the fact that quartz forming a vein is often softer and more uniform than the wall rock, sinking operations can be accomplished more rapidly and economically by an inclined shaft on the vein than by either a vertical or inclined shaft in the country rock.

While it is true that the last advantage claimed may often exist near the surface in dry ground, the advantages are generally more than offset by other disadvantages.

The disadvantages of sinking on the vein may be enumerated as follows.

(1) Nearly all veins carry more water than the walls, hence, if sinking is carried on in the vein in a wet zone, all the water of the region has to be drained while actually sinking, and this with pumps of the sinking type. It is well known that a large volume of water is always more difficult to handle with sinking pumps than with station pumps.

(2) There is yet to be found on the market an ideal sinking pump which will successfully handle gritty water without ceasless delay from the cutting of packing and plungers. In nearly every case this difficulty is found to be greater with the sharp quartz grit from the vein matter than with the wall rock, but is often nearly negligible when sinking in a slate wall or moderately soft porphyry formation. This difficulty is always accentuated when an exceptional volume of water demands quick handling of the pump and the minimum of delay for packing and from breakdowns.

(3) If the vein varies considerably in dip, there will be great difficulty in maintaining favourable track and hoisting conditions when sinking on the vein, and the shaft is liable to be useless for the economic extraction of the ore.

*Reprinted from Bulletin of Mexican Institute of Mining and Metallurgy.

(4) If a large amount of valuable ore exists on either side of the shaft when sinking on the vein, and for commercial reasons it is desired to extract this ore at the earliest possible moment, it will be found difficult to do so without resorting to expensive timbering or else large pillars of ore will have to be left until the rest of the mine is practically worked out, otherwise the shaft will be imperilled by caves from the hanging wall.

The advantages claimed in favour of the vertical shaft are as follows:

(1) It reaches the maximum depth in the minimum time.

(2) It can be driven more rapidly, and timbered with greater ease than the inclined shaft.

(3) The difficulties with the pumping question are never as severe as in the case of the inclined shaft, owing to greater facility in suspending the pump and in the formation of the pump.

(4) It is also generally conceded that the extraction of the ore can be carried on more economically through a vertical shaft than through an inclined one.

Personally I do not think that these claims in favour of the vertical as against the inclined shaft can readily be substantiated. The choice should be controlled by other factors.

Up to a few years ago, when we were dependent upon steam or Cornish pumps for underground work, the inclined shaft also presented serious disadvantages on this score, but with the introduction of electric station pumps and air or electric sinking pumps this is no longer an obstacle. Great facilities are offered by the use of electricity underground, and with the establishment of air compressor stations close to the point of operations, provided the proper equipment is furnished and an intelligent system of work is organized, it should be possible to carry on work just as quickly and efficiently in an inclined shaft as in a vertical shaft.

It is claimed by some engineers in Mexico that ore is most successfully extracted from the mine by wheeling the cars directly on to cages and hoisting these to the surface, hence, there is a further prejudice against the inclined shaft owing to the difficulty of constructing satisfactory incline cages on which cars can be easily handled. Now as a matter of fact, in the majority of camps outside of Mexico experience has shown that greater economy is obtained with the use of self dumping skips, which can be handled just as easily and economically in an inclined as in a vertical shaft.

The factors above enumerated have all to be taken into consideration before final choice is made between an inclined or vertical shaft for the first exploration work. It is certainly as well to combine the advantage of following a vein closely by means of an inclined shaft with the facilities for the economic extraction of waste rock and any ore that may be encountered during exploration work, if this latter can be done as efficiently through an inclined as through a vertical shaft. I believe this is possible, and would, therefore, emphatically recommend an inclined shaft driven at a constant angle in the foot wall and closely following the vein for all exploration work. In this case only short cross cuts will be required to tap the vein at frequent intervals. Less water will probably be encountered in the foot-wall than in the hanging wall side of the vein, and certainly a great deal less water than in the body of the vein itself. Sinking operations, therefore can be carried on with a minimum of difficulty with regard to water, which greatly faciltates the rapd advancement of the shaft.

Pumping stations, and ore bins can be easily located between the vein and the inclined shaft, and, if rich ore, which it is desired to remove at once, is encountered in the vein, stoping operations can be carried on almost from the first start without endangering the safety of the shaft, or preclude the final extraction of ore from the deeper levels.

We have now to consider the second division.

Shafts sunk exclusively for drainage purposes.—These are rare in the case of a virgin vein, and are more often driven to unwater old workings that are known to exist full of water, and are directly in accessable to exist ffull of water, and are directly inaccessable owing to caved, and bad ground that makes it impracticable to make use of the old shafts.

If the vein has a very flat dip it would seem probable at first sight that the best procedure would be a vertical shaft sunk in the hanging wall of the vein, and located so as to cut the vein just below the deepest known workings. But let us suppose a case of comparatively flat surface topography and where an old mine has been taken under option, and it is desired to reach the upper part of the old workings just below water level at the earliest possible date. In this case a vertical shaft would not be best, owing to the fact that very long cross-cuts would have to be driven before the upper workings could be reached.

If we waited until the full depth of the shaft had been sunk and a pumping station installed having a capacity sufficient to control the unwatering of the whole mine, valuable time would be lost before any real progress could be made in lowering the water level to make the upper workings accessible.

Furthermore in case of caved ore bodies in large veins, the hanging wall is liable to be badly fractured and to cause considerable trouble with the alignment and timbering of any shaft sunk near the zone. The seepage water in the hanging wall is liable to be excessive and cause trouble with sinking pumps prior to the establishment of the larger and permanent station pumps.

Another objection to the vertical shaft in cases similar to the above, is that if the ore bodies are found to be workable at levels below the point at which the vertical shaft cuts the vein, it would have to be extended into the foot wall which is typical of standard examples shown in the text books. When the upper levels of the mine are ultimately stoped out, the resulting partial settlement of the hanging wall often developes a bad fracture zone near the point where the vertical shaft intersects the vein, which in some cases has been the cause of endless trouble and expense. As already explained surface topography in relation to the dip of the vein must be a very strong controlling factor in the choice between vertical and an incline shaft. For instance, if a vein dips sharply into a steep hill, an inclined shaft in the foot wall is clearly indicated; whereas if a vein dips with the surface of a hill, a vertical shaft located in the valley below may offer features of accessibility, speed and economy that more than offset any other disadvantages as enumerated above.

Although somewhat out of place in these notes, I think it would be apropos in view of the difficulty often encountered in unwatering ground, to draw attention

to a new system of unwatering which has been recently attempted, and which really consists of a small vertical shaft excavated by means of core drills of large diameter. Where local conditions are favourable to this class of work, it would no doubt compare favourably in speed and economy with shaft, certainly up to moderate depths: particularly in the case of veins dipping with the slope of the hill where an inclined shaft would have great length as against a vertical tube-well of this nature sunk on the lowest part of the ground.

The McKiernan-Terry Drill Company, of New York, have recently put on the market core drills capable of sinking wells of this class of from 18 inches up to 40 inches in diameter, to a depth of 400 to 500 feet; and the Bryon Jackson Iron Works of Can Francisco, California, have for several years successfully built a special type of centrifugal pump which can be lowered to a depth of 250 or 300 feet in a tube-well over 20 inches in diameter, and can be driven by a motor at the surface, and which has a very large capacity, up to 2,000 or 3,000 gallons per minute.

This system of unwatering by means of tube wells has been tried in Northern Mexico, using air lifts for extracting the water. I am inclined to think that there is a considerable field in the future for this system, as its great advantage consists in the fact that the well can be drilled without unwatering; the pumps being lowered after the required depth has been reachd. Its greatest drawback, however, is the limited depth at which pumps suitable for these wells can operate; although I have no doubt that before long means will be found to design pumps which will overcome this difficulty. Core drills are capable of sinking shafts up to 1,000 feet while the maximum head for large capacity pumps suitable for these wells is between 200 feet and 300 feet. I believe that as much as 3,000 G. P. M. have been raised through a tube well of this type, 20 inches diameter and 200 feet deep.

We now come to the economic extraction of ores from a mine (sec. 3) and the advantages or disadvantages of vertical versus incline shafts.

If the ore is to be extracted by means of cars run on to a cage, there is no question but that the vertical shaft is the best and most convenient; but as I have already indicated, modern practice seems to be towards the elimination of the cage in Mexico and the adoption of large size self dumping skips, which are charged from the loading station of underground bins. One of the great advantages of the use of skips as against cages is that they can easily be arranged to handle both ore and water, provided they are of the self-dumping type; and for small mines, not having a great output of ore, and where the water can be controlled by occasional baling with skips, this factor is one demanding consideration.

Shafts which are sunk expressly for the extraction of ore must, of course, be located principally with relation to the main ore shoots and the lateral extent of the vein on either side of the shaft. The mouth of the shaft must also be located with regard to the proposed location of the metallurgical plant. In the case of nearly vertical veins, the vertical shaft is undoubtedly best, and the only other consideration is its location in relation to the above factors. We also have to consider those special cases where there are a number of veins, and the ore from all the various underground workings of these veins had to be delivered at a given point. If the veins are more or less parallel on strike as well as dip and no great distance apart, a vertical shaft is probably the best. I have, however, seen some special cases, one of which has recently been brought to my attention. Here two principal veins dip in opposite directions, their croppings forming very nearly the apex of a great triangle, whose base at a considerable depth would be so long as to prohibit all thoughts of cross cutting from a central vertical shaft; and besides the two main veins, there are other veins parallel on their strike dipping towards the main veins on the hanging wall side which also have to be worked. In this case I would consider the vertical shaft as out of the question, and think that the most simple and economical way of solving the problem would be to drive two incline shafts in the foot wall of either vein, the collars of either shafts being side by side. By this means ores from widely divergent points of depth can easily be delivered to the same starting point for metallurgical treatment. We also have to consider the case where one vein is owned by two companies; the first one of which contols the cropping of the vein and can conveniently sink inclined shafts if required, but where the second company would have to sink a vertical shaft to great depth before reaching the vein, which is known to dip at a comparatively flat angle.

This has been a common case in South Africa, and under these conditions the vertical shaft has in nearly every instance been dropped down to a point where the vein was reached. This has been subsequently followed with an incline shaft in the foot wall of the vein, driven at a constant angle and although some difficulty has been experienced with the heavy wear and strain of the cables at the point where the vertical shaft changes to the incline shaft, this has been largely overcome.

Where, however, the combination shaft can be avoided, it is unquestionably better to put in either an inclined shaft on the same constant grade, or a deep vertical shaft; but where the veins change abruptly in dip, or where the dip reverses at great depth this is almost impossible to accomplish. With the great facilities for underground hoisting stations which now exist, as a result of the perfect electrical equipment which can be installed in mines, the most satisfactory arrangement would seem to be to install a separate discharge and loading point underground, which, if properly planned and handled, should cause but little loss of time or expense per ton of ore handled.

Finally we have to consider those cases where shafts are sunk exclusively for ventilation purposes, or for providing an additional outlet to the mine.

Large diameter core drills are now being used in the States for sinking holes in the hanging wall of the vein for ventilating purposes, and I believe that the speed and facility with which air connections can be made with these drills is not generally appreciated in Mexico. As the holes drilled with these machines are generally of very large diameter up to 20 inches, and even larger, a "shot type" of core drill is generally used for this work, in which case the holes can only be sunk vertically, and must virtually therefore be classified as small diameter vertical shafts.

Where ventilation alone is to be considered, these would certainly be far quicker to put down, and cheaper to drive than any form of standard incline or vertical shaft; and in any case ventilation can be most satisfactorily obtained with a straight well driven shaft than with the greater length required for the incline shaft.

Where, however, the vein dips into the hill instead of running parallel with its face, an inclined shaft will be shorter and more economical to sink than the vertical shaft. In the case of ventilation the ideal condition is to reduce the frictional resistance to the passage of air to a minimum, and to make connections in the most rapid manner possible with the least outlay for dead work.

Other conditions being equal, the really controlling factors between the inclined and vertical shafts for ventilating purposes will be those that I have already specified; though, as a rule, by the time a shaft is required only for ventilation at depth, the ground has been drained, and there are no difficulties to be encountered due to water. Where the shaft is to be sunk, not only for the purpose of ventilation, but is also to be used provisionally to explore and extract a certain amount of ore, all the other factors besides the final one of ventilation have to be taken into consideration.

The above notes will, I think, show that there are many advantages in the case of inclined shafts which have been very generally overlooked in Mexico. It may often occur that an inclined shaft sunk in the footwall of the vein will in the end prove to be the most satisfactory, either for exploring, ore extraction, or unwatering. Sinking can be carried on through undisturbed ground, and the main avenue of communication in the mine is independent of caves, from worked out stopes or settlement of the hanging wall. In the case of unwatering old mines the main pumping stations can be established as soon as reasonable depth below water level is attained, and the old workings tapped by means of horizontal core drills (which avoids the danger of flooding), while sinking operations are in progress to reach the lower levels.

While I realize that this paper is far from complete, I trust that it may be a stimulus for the collection of further data, and a motive for discussion from my coworkers, which will throw added light on this very interesting subject.

THE PETROLOGICAL DEPARTMENT.

[Note.—Engineers and mine managers using the diamond drill are invited to send specimens of their cores for examination at the nominal charge of 35 cents each for slicing. In diamond drilling the most must be made of every core; for it is a tedious and costly work. In this respect the microscope is always an effective aid. Those engaged in working out relations in the Porcupine from drill cores will find its use almost imperative,—for in that district rocks of different character have often much the same outward appearance.]

J. C. M., Porcupine, 1, 2, 3, 4, Graywackes.—These specimens of drill cores are essentially the same. Angular fragments of quartz, feldspars and fine-grained diabase are the chief constituents. In 4 several shreds of muscovite are present. No. 2 is the finest grained—3, 1, 4 being coarser in the order named. These rocks represent original muddy sands, which may have been partly or entirely volcanic in origin. There is no evidence of surface alteration, nor of metamorphism, beyond mere induration.

J. P., Cobalt, A. Quartz Diabase.—This rock is much decomposed, but clearly consisted chiefly of plagioclase and augite with the characteristic diabase structure. A comparatively large amount of quartz is present, intergrown with feldspar. Biotite and ilmenite now represented by chlorite and leucoxene are minor constituents. The alteration is due to weathering.

J. P., Cobalt, B. Graywacke.—This fine grained rock is probably a specimen of the graywacke slate so abundant in the Cobalt district.

G. B. S., Porcupine, 22 Diabase.—The original constituents of this rock are all completely decomposed. The alteration is plainly due to atmospheric agencies. The grain was medium.

G. B. S., Porcupine, 23 Calc Phyllite.—An indistinctly schistose aggregate of sericite, calcite, and chlorite with minute rods of rutile and several grains of quartz that are probably relics. The original character of this rock has been completely altered by metamorphism of a mild degree.

G. B. S., Porcupine, 24 Diabase.—This specimen is completely altered, but, unlike 22, contains much secondary fibrous hornblende. Pressure and heat had therefore something to do with the alteration. It was slightly finer grained than 22.

G. B. S., Porcupine, 25 Calc Phyllite.—Like 23, but contains considerable secondary albite, but not so much calcite.

O. B., Bruce Mines, 1. Diabase.—This coarse rock is still comparatively fresh, only the augite being partially decomposed to chlorite. A small amount of quartz in micrographic intergrowth with feldspar occurs.

O. B., Bruce Mines, 2, Breccia Conglomerate.—This is evidently a specimen of the "slate conglomerate." There is nothing unusual in the section. Angular fragments of quartz and feldspars with particles of various rocks are embedded in a fine cement.

O. B., Bruce Mines, 3, Limestone.—This specimen is from the limestone and chert bands in the "slate conglomerate." Strictly it is a fine grained marble and contains secondary quartz, muscovite, and albite, the latter as large irregular grains filled with inclusions.

INDUSTRIAL NOTES.

Allis-Chalmers Reorganization.

The recent re-organization of the Allis-Chalmers Company is of interest to Canadian machinery users. Through its close connection with the parent company, the Allis-Chalmers-Bullock, Limited, of Montreal, will reap considerable benefit by the strengthening of the position of the Allis-Chalmers by the addition of new capital.

Receivers for the company were appointed in Milwaukee on April 6th, and the names show that the receivership is of a friendly character. The plan of reorganization has been under way for the last three months, and proved satisfactory to all interested. Under it bondholders and the preferred and common stockholders agreed to give up their securities and accept instead preferred and common stock in a new company. The elimination of bonds amounting to $11,148,000, and the addition of new capital amounting to $5,192,000 will place the company in a strong position and enable it to take full advantage of its new shops at West Allis, Milwaukee.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Dominion Coal Outputs.

The output of the Glace Bay mines for March was 353,729 tons, the largest output ever obtained from these collieries in this month. The best previous March output was 346,529 tons, in 1908. For the first quarter of the year the aggregate outputs total 965,000 tons, comparing with 885,885 tons in the first quarter of 1911, and with 946,286 tons in the first three months of 1908.

The weather during the month was favourable to operations, and although the drift ice around the coast is very heavy, the prevailing winds have been such that the movements of the ice-pack have not interfered with navigation to any marked extent.

The production of the new mines is beginning to tell on the daily outputs of the Coal Company. The outputs for the 27th, 28th, and 29th of the month were respectively 15,868 tons, 16,035 tons, and 16,762 tons. On the 27th and 28th No. 6 Colliery was idle, so that, counting in this colliery's production at the usual figure of 1,000 tons, the output for the 28th was equivalent to 17,000 tons. These three days gave the largest output ever obtained by the company in a similar period. It may be predicted that with ordinary favourable circumstances the daily outputs during the summer will occasionally exceed 18,000 tons.

The Springhill mines produced during the quarter 107,000 tons, an increase of 78,000 tons on the year 1911. The March output was 33,470 tons.

The combined increase from the Springhill and Glace Bay mines will, therefore, amount to 158,000 tons over the first three months of the year.

Port Hood Colliery.

There have been some interesting discussions in the Nova Scotia House of Assembly during the preseut session on matters connected with the coal mines of the province, and the Mines Department has been vigorously assailed by the members of the Opposition, with the usual admixture of truth and error that characterizes the tactics of the politician.

A good deal has been said about Port Hood Colliery and the inundation of last June, and an impression seems to be abroad that something might have been done that was not done to save the mine after the water broke in. As a matter of fact, all that could be done was done, aud no criticism can be justly made of the action of either the management of the colliery or the Mines Department, immediately after the water burst in. The time for action had then passed. There was absolutely no hope of damming the flood, and although the management made a brave attempt to control the water, they might just as usefully have done nothing. The situation was beyond human endeavours. The possibility of recovering the mine was one to be decided by mature consideration, and a careful estimate of the financial responsibility involved.

If the Government is open to criticism, it is that it did not itself appoint a commission to report on these and other points, without allowing their opponeuts the kudos of suggesting a most obvious procedure. It is to be heartily regretted that a matter of such importance to the coal mining industry of the province should have been given a political aspect, thus obscuring the real issue.

The cause of the Port Hood inundation is to be found in what was done, or left undone, before the water broke in. Whether the water came directly from the sea, or indirectly, is not a point of very much importance, but what would be useful is to know what caused the fracture of the superincumbent measures. The point of technical enquiry should be directed more to the cause of the failure of the cover, rather than to what happened after the roof broke, and the water had entered the mine.

The personnel of the Commission which the Government has appointed is in itself an assurance that the antecedents of the flood will be thoroughly investigated.

Unworked Coal Areas in Nova Scotia.

The statement is often made that large areas of coal bearing lands in Nova Scotia held under leases from the Provincial Government are being held by speculators, thus preventing their development, to the general detriment of the province. It was stated in the course of debate in the Nova Scotia Parliament that out of 108 leases only 20 covered properties that were being worked. It was further stated that out of 1,010 square miles of coal areas, about 10 per cent. were being operated, or only 146 square miles out of 1,010 square miles. It is certainly open to grave doubt whether there are 1,010 miles of coal lands in Nova Scotia. There are a good many leases issued in Nova Scotia covering tracts of land under which no coal will ever be found, because it is not there. Furthermore, much of the coal lands under lease is territory underlying the sea, distant many miles from the shore. These areas may or may not be worked. Their existence is presumed on good geological evidence, but not as yet proved. Again, they are in some instances so far out to sea that their operation need not trouble this generation nor that which will follow it. If a careful estimate were made of the coal seams in Nova Scotia which it would be feasible and profitable to work at the present time, for comparison with areas actually in operation, the discrepancy would not be so great as some people appear to imagine. Economic conditions decide whether or not coal areas shall be worked, and while thick seams of coal remain unexhausted which can be cheaply mined, less favourable areas with thin seams will be left untouched. There are many thin seams of coal in the Sydney coalfield, which to-day are neglected and thought but little of. Some day, however, they will become valuable. But it is not fair to assume that because an area is held and uot worked that some more or less hypothetical speculator is to blame for its non-development

The C. M. I. and the Mining Societies of Nova Scotia.

At the recent annual meeting of the Nova Scotia Mining Society, Dr. Barlow, of the Canadian Mining Institute, brought before the meeting the advantages which would follow from affiliation with the C. M. I. At the same meeting the advisability of affiliation with the South Cape Breton Mining Society was discussed, and this Society was requested to send a delegation to confer with the Council of the Nova Scotia Mining Society and a delegation from the C. M. Institute. This is a move in the right direction. The beuefits to be obtained from affiliation of technical societies has been proved conclusively by the experience of the Canadian Society of Civil Engineers, the Federated Mining Institute of England, and the American Institute of Mining Engineers. Men actively engaged in the technical direction of large mining enterprises cannot spare the time to attend meetings at a distance. Neither can a large number of papers be read and adequately discussed at an annual meeting. After all the great benefit of any mining society to its members is from the papers which its members contribute, and these are better digested in the leisure which comes between working hours. The chief aim of a mining society should, therefore, be to publish full and well printed transactions, arranged to be bound annually for permanent reference. This, of course, costs money, and is almost impossible for a small society.

Again, the remark is often heard, particularly in Cape Breton, that the proceedings of the Canadian Mining Institute deal too exclusively with metalliferous mining, with the Cobalt and Porcupine regions, and contain very little that interests the coal miner. Exception is sometimes taken also to the prepon-

derance of papers on gold mining and kindred subjects read before the Nova Scotia Mining Society, although it must be admitted that no such objection can be urged against the papers read at Halifax this year. Affiliation, howeved, would provide a remedy for all this, and would enable each society—while retaining its own identity completely and all the social advantages this carries with it—to participate in the advantages of a set of transactions covering every field of mining. In a country so vast as Canada, with such a varied range of mining branches, there is a unique opportunity for a mining institute which shall embrace and federate all the existing societies, and adequately represent the mining industry of the nation. But this can not be done by an Institute which meets in Montreal, Toronto, or Ottawa, unless that Institute is affiliated with the east as well as with the west.

It will surely be to the mutual benefit of the Canadian Mining Institute, the Nova Scotia Mining Society, and the South Cape Breton Society to join hands, and it is to be hoped that the rapprochement will be carried to its logical conclusion.

ONTARIO.

Porcupine, Swastika, and Larder Lake.

So far developments at the Hollinger mine have more than justified the estimates Mr. P. A. Robbins made in his annual report. To date the most favourable developments have been on No. 2 vein and No. 4. In the report, No. 4 vein was estimated to contain 35,000 tons for the first 200 feet, although the 200-foot level had not then been reached. The vein at the 200-foot level has just been cut at the time of writing, and while it has not yet been sampled, it bears a strong resemblance to the vein at the 100-foot level where it was good payable ore. The cross-cut from No. 1 vein was pushed 200 feet and had passed under a point directly below where the vein should have appeared. The walls of the cross-cut were then washed down and on the north could be seen some pyrite which gave a low assay. A round of holes was then driven and when fired a four-foot vein of quartz was opened up. On the 100-foot level the No. 4 vein is so much better in grade and so many breaks in the vein have been filled in that it is estimated that there is now about twice as much ore in sight on this vein as was estimated in the report. Development work on No. 2 vein has been so much better than expected that it is computed that $1,800,000 is estimated rather than $1,200,000. These estimates are not of ore actually blocked out, but of what may reasonably be expected to be developed. The work on the main vein is proceeding more slowly. To the north the drift is now in bad ground, and it is probable that the commencement of the next ore body will not be picked up for 80 or 100 feet. At the end of this barren patch a winze has been sunk 30 feet below the 100-foot level and there shows $32 ore, so that the probability that the ore shoot does not continue down to the 200-foot level is now very small.

The first fruits of the McIntyre ten-stamp mill have been shipped out in the form of two small gold bricks, worth about $5,500. The management give out the report that 75 per cent. of the gold is being saved on the plates and that the tails, after concentration, only run 58 cents.

Another strike is said to have been made on the Tough claims at Swastika. During the winter and so far this spring Swastika has been the only prospecting ground that has yielded the prospector any results at all. Silver is reported to have been found in Lebel township, and several spectacular discoveries of gold are reported from claims within a few miles of Swastika.

A six-drill compressor has been installed along with two 60 horse power boilers at the property of the Hollinger Reserve mines. The shaft is now down 40 feet, and will be sunk to 200 feet without a check. The ore in the main vein is said to average $12 to the ton.

The main shaft at the McEnaney mine of the Crown Reserve Mining Company, is being sunk to the 300-foot level, while drifting operations are still in progress on both the 100 and 200 levels.

A small prospecting plant has recently been installed on the Kenora property in the Three Nations section of Whitney Township, and sinking can now be undertaken to greater advantage. It is reported that a good body of milling ore is indicated. Native gold is also being discovered in the bottom of the shaft of the Three Nations Mining Company at a depth of 140 feet.

Two new veins have been cut on the Plenaurum property on Pearl Lake, both at the 200-foot level. One was cut on the north shore and one on the south shore.

A new six-drill compressor and a boiler have been installed at the Crown Chartered to work the Davidson lease. This will enable the company to operate to much better advantage than they have heretofore been able to do.

The power situation has now adjusted itself until the spring freshet runs on the Mattagami River. The only sufferers from insufficient head of water now are the Plenaurum, which has rented the Bewick-Moreing compressor, and the Jupiter, which is operating again with its old steam plant. There are, however, pretty general apprehensions of further trouble at the Porcupine power plant when the Mattagami River is in flood after the snow melts.

Cobalt, South Lorrain, Gowganda, and Elk Lake.

There is considerable activity at the Green-Meehan mine. Under the name of the Sata Maris, a considerable quantity of low grade ore is being despatched to a Cobalt concentrator for treatment.

The La Rose Consolidated has increased its dividend rate from 8 per cent. per annum to 10 per cent. per annum. At the old rate of 2 per cent. it amounted to $150,000, and at two and a half per cent., $187,000. The La Rose has now paid $2,766,685 in dividends.

Continuations of two productive veins have been discovered on the McKinley mine under the swamp at the 150 and 200-foot levels. In a very short time an aerial tramway will be started to connect the Savage with the McKinley-Darragh, so that all the lower grade ore which is now being treated in the jigging plant at the Savage will come direct to the parent mine for treatment.

Several properties on Cart and Peterson Lakes have recently resumed operations. The Little Nipissing is being developed by the Peterson Lake Mining Company, the old Kerry lease, now the Seneca Silver Mining Company, is working again, and another attempt is being made by the Gould Consolidated to pick up one of the Nipissing veins.

Another new vein has been cut on the Silver Leaf property at the 470-foot level at 280 feet south of the shaft. The vein when first discovered was of barren calcite, but now carries low values.

The Nova Scotia Cobalt Mining Company has gone into liquidation. The company has for a long time not possessed any ore of its own to put through the large mill on Peterson Lake, but an attempt was made to raise money treating ore from the Kerr Lake, the Crown Reserve, and the Drummond. It has now been discovered that the process under the contracts signed with the various companies would not give an extraction which would yield the company any profit at all, and it has now been decided to go into liquidation. A meeting of the creditors is called for April 12th, at the King Edward Hotel, Toronto.

BRITISH COLUMBIA.

Nelson.—Two months ago the Hon. the Minister of Mines approved the recommendation of the Provincial Mineralogist to the effect that average samples of the ore or dike-matter occurring on the property of the Kootenay Gold Mines, Limited,

known as the Granite-Poorman mines, situated near Nelson, be obtained and sent to eminent analytical chemists for determination whether or not it contains, as had been alleged it does, platinum or metals of the platinum group in commercially payable quantity. Accordingly the Provincial Mineralogist took steps to carry into effect the object of his recommendation. Many statements that (in the absence of verification by metallurgical chemists widely known to be fully competent to determine whether or not any of the platinum group of metals do occur in the ore referred to, in sufficient quantity to make their presence of commercial importance) may reasonably be regarded as open to question, have been published in Nelson and sent out from there in press despatches, until it has been deemed desirable for the Provincial Department of Mines to endeavour to ascertain whether or not there is warrent for even the less glowing of the allegations that have been made and given wide publicity. It is significant that both Dominion Government officials and assayers in the employ of companies possessing well-equipped laboratories, have stated that in their examinations and tests the claims made relative to the presence of the platinum metals in ores obtained in the vicinity of Nelson have not been sustained. The action of the Provincial Department of Mines is, therefore, the more commendable, since investigation by thoroughly impartial and independent men may be expected to show either that platinum metals really do occur in quantity sufficient to be of commercial importance, or that the statements made to the effect that they do were those of ill-informed and irresponsible persons, and consequently both unreliable and mischievous in their effects.

Hedley, Similkameen.—Recent information concerning the results of the mining and stamp-milling operations of the Hedley Gold Mining Company indicates that they continue to be profitable and that the profit earned during the first quarter of 1912 was larger than in the corresponding period of 1911. At the time of writing available information covers the months of January and February, and but three weeks of March, so that the figures for 1912 used in making a comparison between the results of the respective first quarters of the two years must be regarded, so far as those of 1912 are concerned, as, to a small extent, only approximate. The figures for 1911 were:—

Month.	Tons Milled.	Assay Value.	Profit.
1911—			
January	4,239	$11.29	$17,979.85
February	3,929	11.98	16,862.92
March	4,391	11.90	22,477.85
Total	12,559		$57,320.62
1912—			
January	5,701	$10.70	$25,928.92
February	5,010	9.49	17,382.09
March (21 days)	4,232	12.18	
Estimate for remaining 10 days	2,015		33,365.22
Total	16,958		$76,676.23

An analysis of the foregoing figures will result in showing for the first three months of 1912 an estimated increase in quantity of ore crushed of nearly 35 per cent., and in profit of about 34 per cent. It may be stated that the tonnage for the latter part of March has been estimated as similar to the average daily quantity for the immediately preceding 21 days, while the profit has been calculated on the basis of that of the average profit per ton of ore milled through the whole of 1911, namely $5.34. This estimate should prove conservative, for the reason that the exigencies of doing thoroughly good mining work required the breaking down of a quantity of rock that reduced the average assay value of the 5,010 tons of ore milled in February to $9.49, which was $1.06 per ton lower than the lowest monthly average during the whole of 1911. As the average assay value for one month of 1911 was $14.36, it will be reasonable to look for a similarly high average for at least one month of 1912 to offset the unusually low value for last February. The information here given is submitted with the idea that as it bears upon the results obtained at the largest mine and mill in British Columbia at present operated for gold only, it will interest many readers of the Canadian Mining Journal. There are several other mines in the province the annual production of which includes a larger quantity of gold than that produced by the Hedley Gold Mining Company, but this is in conjunction with silver and copper as well. It is noteworthy, as indicating the efficiency of the gold-saving appliances and methods of the Hedley Gold Mining Company, that in 1911 there was made an average extraction of 94 per cent. of the gold contained in the ore milled.

Princeton, Similkameen.—The British Columbia Copper Company, which is doing development work on several of the 63 mineral claims of the Voigt group it holds under option of purchase, is obtaining distinctly encouraging results on claims Nos. 14 and 18. In a cross-cut on No. 14 claim 8 feet of ore was encountered at a depth of between 90 and 100 feet. Of this about two feet gave assay returns of $24 in gold and copper. A good-sized lump of ore sent to the company's head office, New York, contained gold 0.55 per ton, and copper 8 per cent. Much ore of good grade has also been found on No. 18 claim. These results are considered favourable, and it is hoped they are but preliminary to more important discoveries that will justify the company in eventually purchasing and extensively working this Copper Mountain property.

Britannia, Coast.—Last year's favourable developments and results at the Britannia Mining and Smelting Company's mines on Britannia Mountain, near Howe Sound, together with the higher price now obtainable for copper, has led to the adoption by this company of even more activity than that which characterized its operations last year. Mention has already been made in the Journal that in 1911 this company mined and treated at its large concentrating mill, more than 100,000 tons of ore and produced concentrate averaging about 14 per cent. copper, its production of that metal having been between 8,000,000 and 9,000,000 pounds. Estimates of developed ore in the Britannia mines vary between totals of 450,000 and 1,000,000 tons, and average copper value contained therein up to 4 per cent. Taking the lower estimated tonnage only, and an average copper content of 3 per cent., and an average recovery of only 80 per cent. of the copper, as was made in 1911, it will be seen that at the present market price of copper there is a comparatively large realizable value available. To take fuller advantage of these favourable conditions than is practicable under existing local circumstances, it is planned to double the capacity of the hydro-electric power plant, and make provision for conveyance of a much larger quantity of ore from the mines to the concentrating mill and shipping dock at Britannia Beach. In connection with these intended necessary additions to producing facilities, Mr. Grant B. Schley, of New York, who has long financed this enterprise, recently went west, for the purpose of discussing on the spot with the company's general manager, Mr. J. W. D. Moodie, the nature and extent of the improvements and the most effective means of making them expeditiously. For several months the company has had from 500 to 700 men in all employed at its mines and concentrating mill, and it is not unlikely that the number will shortly be increased considerably.

GENERAL MINING NEWS

NOVA SCOTIA.

Glace Bay.—The screening plant for No. 15 colliery, Waterford, is now on the way from Plowright Bros., England, and should arrive here in a few weeks' time. The plant consists of two tipples, two sets picking tables, two sets perforated plate screens, one loading belt, and all other necessary accessories.

Glace Bay.—Experiments are being made with the improved Cottar mining machine, in Nos. 4 and 10 collieries. The mines in the Waterford district are equipped with this type, which are giving satisfaction.

Glace Bay.—Some of the miners have been growing somewhat careless lately in obeying the Mines Regulation Act in spragging their coal, and two hand-pick miners have been arraigned before Stipendiary John J. Smith charged with violation of the Mines Regulation Act in that regard. There are too many violations of the Act in respect to spragging in all the collieries, and as a result of a miner's carelessness or neglect to sprag his coal, accidents occur, especially in sections where there is "proud" coal.

Glace Bay.—S. S. Halvista was in port of Louisburg loading a coal car for St. Vincent, Africa, a Portuguese coaling station. She is taking 8,000 tons cargo and 900 tons bunker. This is the largest coal cargo and bunker shipped at this port up to the present.

ONTARIO.

Cobalt.—An English company has taken over the Little Nipissing shaft near the Right of Way and will cross-cut for an ore body that has already been located from this spot.

Cobalt.—An additional 20 stamps are being added to the equipment of the Townsite mill at the Northern Customs concentrator in Cobalt, this bringing the total milling capacity for Townsite ores up to 50 stamps. The additional equipment was found necessary owing to the increased output from the Townsite. When these additional stamps are dropping there will be a total of 94 stamps in operation at the Northern Customs concentrator.

Cobalt.—The additional equipment which is being added to the Casey Cobalt consists of a small experimental mill of five stamps and a three-drill compressor. The mill, which is being installed now is of a small experimental type, and if it is found that the Casey Cobalt ores can be treated satisfactorily by this the construction of a large mill will be commenced.

South Porcupine, April 5.—The new vein encountered on the north and south crosscut on the 200-foot level of the No. 1 shaft of the McIntyre is proving to be one of the most important on the property. The crosscut is into the vein 15 feet without yet picking up the wall.

Porcupine.—Two shafts are being sunk on the Miller-Middleton lots, west of the Hollinger holdings. The main shaft is down to a depth of 76 feet, while the No. 2 was started last week. Both are located along the west edge of the bluff of rock that extends across the lots from the Hollinger.

The Keora mine has started work. A small boiler and a steam hoist have been installed for future deep sinking. The main shaft is down to the 50 foot level, and with the aid of the prospecting machinery it will be deepened to the 100-foot depth.

Robert Clark, of Buffalo, former owner of the Clark claims in Northern Whitney, now turned over to the Gold Crest Mining Co., is in the camp. Mr. Clark will be in charge of the field work on the property. Boilers, compressor for five drills, hoist for 500 feet, pumps, and camp electric lighting plant are being taken into the property. The Trinity-Cobalt outfit was purchased.

The management of the "big" Dome at Porcupine has planned to accomplish 10,000 feet of underground development during the summer. A shaft will be sunk to the 500-foot level, while the other levels will be opened out. In all 24 drills will be operated.

Sudbury.—The Mond Nickel Company is extending operations at Garson mine, with the view of having a steady supply of ore for the new works at Coniston, which are now under construction. It is to be hoped that an effort will be made to have the road from Sudbury benefit by the enlightened and liberal policy of both the Dominion and Provincial administrations.

The Syndicate holding option from Stobie and Tough, of the Lavack nickel claims, has been at work for some time, stripping and trenching the surface. Three diamond drills are at work and the ore body has been traced for some distance.

The work on the new Grondal plant of Moose Mountain, Limited, is being pushed along with all possible expedition, but the plant is a large undertaking and some time yet must elapse before it is completed. Probably June 1st will see it ready for operation.

Port Arthur.—The report that a diamond drill was at work on the iron discovery just north of town, and that some recent assays indicate a remarkable rich sample of ore, has aroused considerable excitement, both in Fort Frances and International Falls.

Dryden, April 5.—Work on the Good Luck claims, sold by Mr. E. G. Rogers to Bewick, Moreing & Company, is progressing rapidly. Work is being done on two shafts, which are now down 65 and 50 feet. Cross-cutting has proven the vein to be very wide.

BRITISH COLUMBIA.

Vancouver.—Construction of a smelter with a treatment capacity of 2,000 tons daily, at Granby Bay, Portland Canal District, for the Granby Consolidated Mining & Smelting Company, will be started in May. During the present year much work will be done on the development and equipment of the Hidden Creek mine at Granby Bay. The site for the proposed reduction works, which will also treat custom ores, has already been graded. A surface tram will convey the ore from the mine to the smelter at tidewater.

Vancouver.—The recent increase in the price of copper has stimulated mining operations at the Britannia mine on Howe Sound. The company now has over 700 men engaged in development work, as well as in carrying out extensive improvements about the mill. Shipments are averaging about 5,200 tons, including concentrates, monthly.

Revelstoke, April 4.—The Pioneer Placer Mines, Limited, owned by E. A. Bradley and associates, of Revelstoke, has decided to install a Keystone placer testing drill to determine the values of their properties on French Creek, in the Big Bend district, adjacent and tributary to this city.

Phoenix.—In the Voight property, which the B. C. Copper Company took under option last year, some important development work has been done. At a depth of a hundred feet in a cross-cut running from the shaft, a very promising vein has been found, which was eight feet wide. Drifting on this vein has been continued for a distance of 105 feet, and it is believed the ore will run to depth.

GENERAL.

Washington.—A valuable discovery of soluble potash salts has been made in the Mojave Desert, Southern California, by field representatives of the Bureau of Soils and Geological Survey. The potash was found in a partly dried-up lake. There are indications of millions of tons of potash.

San Francisco, Cal.—California mining men are quietly preparing for a systematic invasion of High Grade in Madoc County as soon as weather conditions permit. Several prominent San Francisco capitalists are outfitting prospectors and arranging to be at Fort Bidwell to take advantage of the first rush. The present warm weather prevailing throughout the state is expected to melt the snow at High Grade more rapidly than first anticipated, and the Golden State miners do not intend to be distanced by their brothers of Nevada, Colorado, and other states.

Spokane, Wash.—Dates for the American Mining Congress, to be held in Spokane this year, have been fixed for Nov. 25-30.

COMPANY NOTES

LA ROSE DIVIDEND RECORD.

The dividend record of the La Rose Mines Company, including the forthcoming payment, is as follows:

	P.C.	Bonus.	Amount.
1908—October 20	3	.	$171,505
1909—January 20	3	1	228,480
1909—April 20	3	1	228,840
1909—July 20	3	1	300,000
1909—October 20	3	1	300,000
1910—January 20	2	.	150,000
1910—April 20	2	.	150,000
1910—July 20	2	.	150,000
1911—October 20	2	.	150,000
1911—January 16	2	.	150,000
1911—April 16—	2	.	150,000
1911—July 16	2	.	150,000
1911—October 16	2	.	150,000
1912—January 16	2	.	150,000
1912—April 16..	2½	.	187,000
Totals	35½	4	$2,766,685

Dividends amounting to $1,204,862 were also paid by the La Rose when privately owned.

THE INTERNATIONAL NICKEL CO.

The International Nickel Company has recently declared a 7 per cent. dividend on the common stock, which calls for $810,784, and brings the total of dividends for the fiscal year, which ends on March 31st, to 18½ per cent., which makes $1,841,786 distributed to stockholders in the last twelve months.

Last year the company increased the common stock issued from $8,872,662 to $11,582,629. The year ended March 31st, 1910, showed 17.27 per cent. earned on the $8,872,662 common stock, and last year showed approximately 28 per cent. on the increased common issue.

NIPISSING FOR 1911.

The Nipissing Mines Company enjoyed the best year in its history in 1911, with earnings running better than $2,000,000. From this amount there was paid in dividends $1,800,000.

The company's yield approximated 5,200,000 ounces, which was produced at an average cost of less than 14 cents per ounce, comparing with 14.72 cents per ounce in the previous year.

A very significant result of the past year's operations was the saving of 74 per cent. of the total gross production for net profits.

Although a smaller amount of development work than usual was accomplished high-grade ore reserves were increased by about $250,000, while total reserves of all grades were swelled by almost $1,000,000 to $4,500,000, the greatest in Nipissing's history.

Prospecting was cut down materially last year owing in part to the delay in delivering the hydraulic plant. In fact, it did not amount to more than 33 per cent. of the previous twelve months' efforts in this direction. Of its 846 acres Nipissing has a virgin territory remaining of about 270 acres.

BRITISH COLUMBIA COPPER CO.

The balance sheet of the company for the year ended Nov 30, 1911, shows assets as follows: Properties at cost, $3,426,901; metals and smelter product, supplies, etc., $245,172; copper on hand and in transit, $132,343; prepaid insurance and taxes, $2,506; accounts receivable, $4,666; cash, $3,826,029.

The liabilities of the company at the close of the year were: Capital stock, $2,958,545; sundry creditors, $146,473; reserve for employees' liabilities, $3,749; profit and loss surplus, $717,262; total, $3,826,029.

The company has secured options to purchase the Copper and Riverside claims in Franklin camp, the Greyhound claim in Deadwood camp, the L. H. claim, near Silverton, and the Voight claims near Princeton.

Shipments of ore for the year amounted to 384,588 tons, of which $340,029 tons were from the Mother Lode mine. The company's smelter handled 608,945 tons of ore and blister copper production amounted to 10,044,093 pounds, containing 9,944,987 pounds of fine copper, 31,144 ounces of gold, and 134,266 ounces of silver.

DOMINION STEEL CORPORATION.

The Dominion Steel Corporation statement for March, just issued, shows that this big concern is doing a tremendous heavy business, and that the closing months of the company's fiscal year are adding largely to the success of the whole enterprise.

The steel plant is running full time in order to meet the demand for manufactured goods supplied by the company, while at the Dominion collieries the output of coal is creating new records practically every day.

The output from the steel plant for March is as follows:

	Tons.
Coke	42,160
Iron	25,425
Steel Ingots	27,710
Blooms	21,230
Rails	11,095
Rods	778
Total shipments	19,305
Coal output	353,170

KERR LAKE DIVIDENDS.

The directors of the mine have declared their regular quarterly dividend of 25 cents a share on the capital stock of the company. This dividend is No. 26, and is payable on June 15 to

stockholders of record June 1. This is the third of the 5 per cent. dividends to be paid by Kerr Lake, and will bring the total percentage of dividends paid by this mine to 134 per cent. The following shows the payments made to shareholders since the mine first entered the dividend-paying class:

	P.C.	Amount.
1905	½	$ 15,000
1906	4½	135,000
1907	8	240,000
1908	15	450,000
1909	23	690,000
1910	40	1,200,000
1911	10	300,000
1911	10	300,000
1911	8	240,000
1911	5	150,000
1912	10	300,000
	134	$4,020,000

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

The following table shows the Cobalt ore shipments for the week ending March 30th, and for the year to date:

	Week.	Year to date
Beaver	.....	123,988
Buffalo	58,936	653,897
Can. Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers-Ferland	64,000	192,000
City of Cobalt	57,620	226,298
Cobalt Lake	.....	206,530
Cobalt Townsite	.....	457,744
Colonial	.....	40,000
Coniagas	.....	814,057
Crown Reserve	.....	256,139
Drummond	.....	604,000
Hudson Bay	64,332	376,744
Kerr Lake	60,905	384,913
La Rose	130,313	1,683,114
Mann (Gowganda)	.....	40,000
McKinley	84,965	1,368,617
Millerett	.....	126,000
Miller Lake-O'Brien	.....	96,500
Nipissing	.....	1,043,710
O'Brien	64,017	398,970
Provincial	.....	44,440
Right-of-Way	.....	220,296
Temiskaming	.....	432,805
Trethewey	55,311	241,134
Wettlaufer	40,383	160,470
Totals	674,812	10,767,363

The bullion shipments for the week were as follows:—

	Ounces.	Value.
Nipissing	98,366.02	$57,296.02
Crown Reserve	13,000.00	7,572.50
Totals	112,366.02	$64,868.52

COBALT ORE SHIPMENTS.

The following table shows the Cobalt ore shipments for the week ending April 6th, and for the year to date:—

	Week.	Year to date
Beaver	.....	123,988
Buffalo	56,635	710,582
Can. Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers-Ferland	.....	192,000
City of Cobalt	.....	226,293
Cobalt Lake	64,150	270,680
Cobalt Townsite	78,000	535,744
Colonial	.....	40,000
Coniagas	184,400	998,467
Crown Reserve	42,430	298,563
Drummond	.....	604.000
Hudson Bay	.....	376,744
Kerr Lake	.....	384,913
La Rose	77,338	1,760,482
Mann (Gowganda)	.....	40,000
McKinley	137,981	1,506,598
Millerett	.....	126,000
Miller Lake-O'Brien	.....	96,500
Nipissing	65,112	1,108,822
O'Brien	.....	398,970
Provincial	.....	44,440
Right-of-Way	.....	220,296
Temiskaming	54,934	487,739
Trethewey	53,000	294,134
Wettlaufer	56,000	216,470
Totals	869,980	11,637,343

The bullion shipments for the week were as follows:—

	Ounces.	Value.
Nipissing	24,875.00	$14,645.22
Crown Reserve	22,234.00	12,212.20

BRITISH COLUMBIA ORE SHIPMENTS.

Consolidated Company's Receipts.

Ore production and shipments to Consolidated for week ending March 24th:—

	Week.	Year to date.
Rossland—		
Centre Star	3,770	36,560
Le Roi	954	10,401
Le Roi No. 2	363	598
Bluebird	...	57
East Kootenay—		
Sullivan	851	5,566
St. Eugene	.....	401
Society Girl	.....	21
Ainsworth—		
Utica	.....	132
No. 1	24	286
Slocan—		
Standard	202	2,234
Van Roi	125	1,079
Hewitt	.....	59

	Weeks	Year to date
Ottawa	.....	28
Eastmont	.....	51
Fidelity	.....	61
Richmond-Eureka	31	415
Rambler-Cariboo	65	411
Reco	.....	24
Lone Bachelor	.....	31
Ruth	44	259
Middleton	.....	24
Other mines	.....	228
Nelson—		
Canadian King	.....	54
Arlington	.....	670
Nugget	22	44
Granite-Poorman	.....	70
Queen	.....	70
Emerald	.....	833
Vancouver	17	17
Molly Gibson	.....	131
Monarch	25	86
Silver Cup	.....	86
Devlin	11	11
Foreign—		
Knob Hill	86	1,037
Hope	.....	20
Northport	.....	34
Bonanza	.....	80
Totals	6,695	65,231

B. C. ORE SHIPMENTS.

Consolidated Company's Receipts.

The production and shipments to the Consolidated for the week ending March 30th were:—

Rossland—	Week.	Year to date.
Centre Star	2,457	39,017
Le Roi	858	11,259
Le Roi No. 2	376	5,457
Bluebird	...	57
East Kootenay—		
Sullivan	872	6,438
St. Eugene	.....	401
Society Girl	.....	21
Ainsworth—		
Utica	.....	132
No. 1	25	311
Slocan—		
Standard	163	2,397
Van Roi	31	1,110
Hewitt	.....	59
Ottawa	.....	28
Eastmont	.....	57
Fidelity	.....	61
Apex	.....	36
Richmond-Eureka	28	443
Rambler-Cariboo	.....	411
Reco	.....	24
Lone Bachelor	.....	31
Ruth	.....	259
Middleton	.....	24
Other mines	.....	228
Nelson—		
Canadian King	.....	54
Arlington	.....	670
Nuggett	.....	44
Granite-Poorman	.....	70
Queen	40	110
Emerald	.....	833
Vancouver	.....	17
Devlin	.....	11
Molly Gibson	113	244
Silver Cup (Lardo)	....	86
Monarch (Field)	28	114
Foreign—		
Knob Hill	29	1,066
Hope	.....	20
Northport	.....	34
Bonanza	.....	80
Totals	5,020	70,251

BRITISH COLUMBIA ORE SHIPMENTS.

Boundary Ore Tonnages.

Following are the returns of the output of the mines and smelters of the Boundary district for the week ending March 24, and year to date:—

Granby	23,437	266,440
Mother Lode	7,512	93,297
Rawhide	5,248	27,952
Jack Pot	587	7,256
Athelstan	.....	340
Emma	.....	4,901
Others	232	2,865

Smelter Tonnages.

Granby	24,595	313,267
B. C. Copper Co.	13,324	133,318

For the week ending March 30, and year to date:—

Granby	24,224	290,664
Mother Lode	7,836	101,133
Rawhide	5,050	33,002
Jack Pot	554	7,810

Smelter Tonnages.

Granby	23,720	336,987
B. C. Copper Co.	12,175	145,493

DOMINION COAL COMPANY'S OUTPUT.

The March output of coal from the collieries of the Dominion Coal Company totalled 353,401 tons. This is the largest March output on record, and beats the best previous production for that month, made in 1908, by 6,872 tons. Last month's tonnage was 23,000 tons in excess of February, and 72,000 tons head of January. The total output for the first three months of the present year is 964,734 tons. The output for March by collieries is as follows:—

No. 1, 52,117; No. 2, 69,787; No. 3, 9,995; No. 4, 32,659; No. 5, 24,974; No. 6, 16,762; No. 7, 14,542; No. 8, 12,252; No. 9, 37,432; No. 10, 17,039; No. 12, 26,927; No. 14, 22,978; No. 15, 7,499; No. 16, 5,767; No. 21, 1,477; No. 22, 1,194.

SHARE MARKET.

(Courtesy of A. E. Bryant & Co.)

New York Curb.

	Bid.	Ask.
Braden	5⅜	5⅝
B. C. Copper	5⅜	5½
Giroux	6¼	6⅜
Green-Cananea	9	9⅛
Inspiration	20¼	20½
Yukon Gold	3⅝	3¾

	Bid.	Ask.
Goldfields Cons.	4⅛	4¼
Nevada Cons.	20¼	20⅜
Miami	26⅛	26¼
Ray Cons.	19¾	20
Chino	28½	29¼

Cobalt Stocks.

	Sales—Low.	Sales—High.
Bailey	2⅜	..
Beaver Consolidated	43½	44
Buffalo	*125	..
Chambers-Ferland	13½	..
City of Cobalt	13	..
Cobalt Lake	*25¾	..
Coniagas	780	785
Crown Reserve	310	..
Great Northern	12½	..
Gould	3⅛	..
Gifford	3	..
Green-Meehan	1⅞	1⅞
Hargraves	..	9
Kerr Lake	290	..
La Rose	..	**375
McKinley-Darragh	165	167
Nipissing	..	**825
Nova Scotia	3½	..
Ophir	10¾	11
Otisse	1⅜	..
Peterson Lake	9¾	10
Rochester	3	..
Right of Way	8¾	9
Silver Leaf	*5	..
Temiskaming	40	41¾
Trethewey	65	..
Wettlaufer	65	..

*Bid. **Offered.

Porcupine Stocks.

	Sales—Low.	Sales—High.
Apex	.05¼	..
Crown Charter	.33	.34½
Dome Extension	.68	.70
Foley-O'Brien	..	*.33
Hollinger	12.00	12.05
Jupiter	.43	.44
Moneta	*.15	..
Pearl Lake	.19½	.20
Porcupine Central	5.30	5.35
Porcupine Imperial	.06	.06¼
Porcupine Northern	1.62	1.68
Porcupine Tisdale	.04½	..
Porcupine Southern	2.09	2.13
Preston East Dome	.11½	.12
Rea	.50	.54
Standard	.06¾	.10
Swastika	.23½	..
Vipond	.43	..
United	.03	.04
West Dome	*.36	..

Sundry.

Island Smelters	.12½	.13
Canadian Marconi	7.85	7.90

*Bid. **Asked.

TORONTO MARKETS.

April 10—(Quotations from Canada Metal Co., Toronto):
Spelter, 6.85 cents per lb.
Lead, 4.50 cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 16.50 cents per lb.
Electrolytic, 16.50 cents per lb.
Ingot, brass, 7 to 12 cents per lb.

April 10—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto):
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼ inch lump.

Coke.

April 8.—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $2.35 to $2.40 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.

April 8—Tin, straits, 43.35 cents.
Copper, Prime Lake, 15.95 cents.
Electrolytic copper, 15.80 cents.
Copper wire, 17.00 cents.
Lead, 4.25 cents.
Spelter, 6.85 cents.
Sheet zinc (f.o.b. smelter), 8.65 cents.
Antimony, Cookson's, 8.00 cents.
Aluminum, 19.00 to 19.50 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $43.50 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
March 20.	58½	26 15/16
March 21	58¼	26 13/16
March 22	58½	26 15/16
March 23	58¼	26 13/16
March 25	58¼	26 13/16
March 26	58¼	26 13/16
March 27	58⅛	26¾
March 28	58¼	26 13/16
March 29	58⅛	26¾
March 30	58	26 11/16
April 1	58⅛	26¾
April 2	58¼	26 13/16
April 3	58¾	27 1/16
April 4	58⅞	27⅛
April 5	58⅞	27⅛
April 6	58¾	27 1/16
April 8	58¾	Holiday

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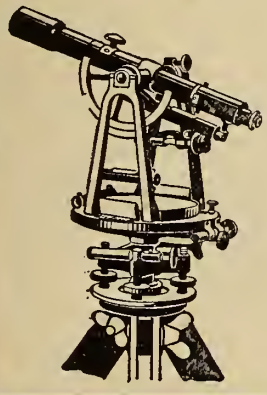

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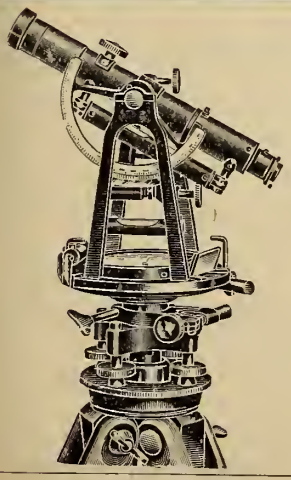

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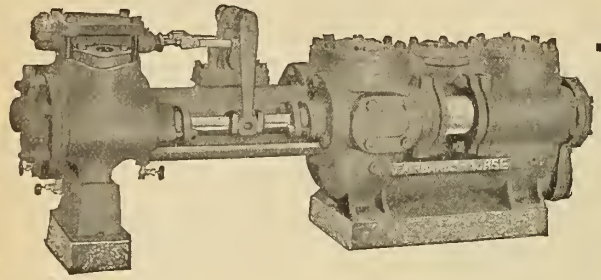

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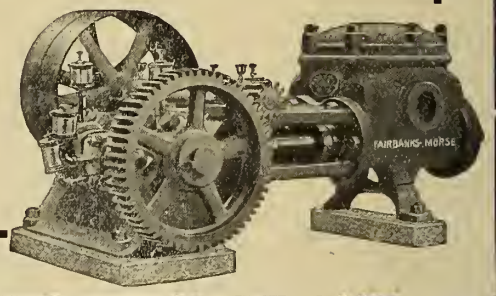

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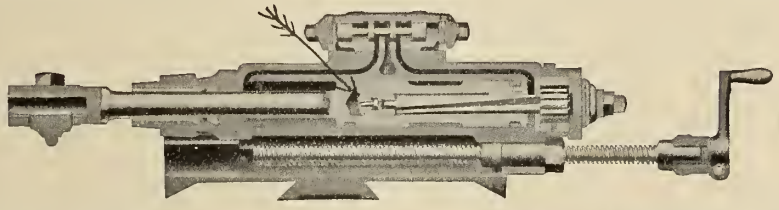

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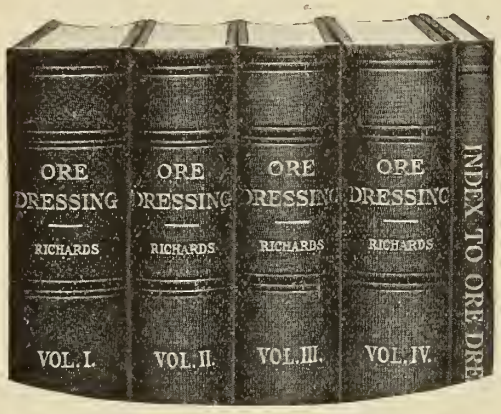

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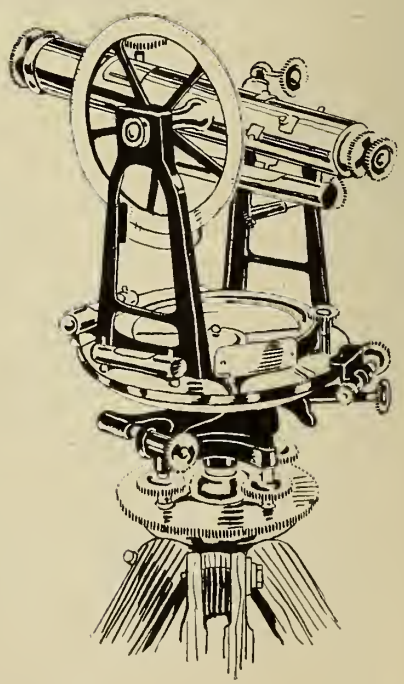

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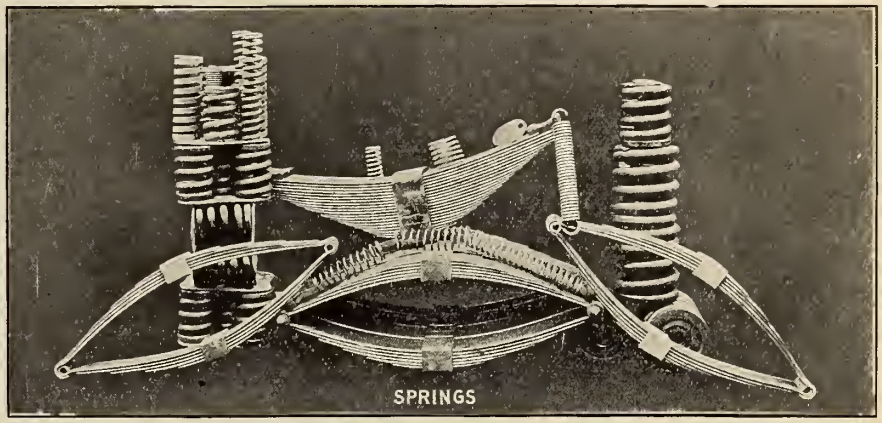

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HANNIBAL, MO., covered with over
200000 Squ Ft of J-M ASBESTOS ROOFING

The need of paint or gravel on a roofing is positive proof of its weakness—positive proof that the materials in the roofing would dry out, rot, rust, decay or otherwise deteriorate without such protection—positive proof that the roofing itself can't last long unless protected with a ***mineral.***

Instead of a perishable animal or vegetable material only ***temporarily*** protected with a ***thin layer of mineral*** such as paint, slag or gravel, J-M Asbestos Roofing is ***one solid mass*** of ***minerals.*** Not a particle of perishable material in it.

J-M Asbestos Roofing consists of layer-on-layer of pure Asbestos Felt securely cemented together with genuine Trinidad Lake Asphalt. Asbestos is a rock, or stone, and, of course, stone needs no coating to make it last. And the Asphalt Cement between these stone layers is the same material that has withstood the severe duties of street paving for forty years. So J-M Asbestos Roofing is an ***all-mineral*** roofing.

J-M ASBESTOS ROOFING

is the only ready roofing that never requires a single cent's worth of coating or other protection. Its first cost is its only cost. Other ready roofings are a continual trouble and expense—for the paint and gravel wash and blow off and have to be renewed every few years.

Because of this mineral or stone construction J-M Asbestos Roofing is also rust-proof, rot-proof and acid-proof. And fire that will melt iron won't ignite this roofing.

We'll sell you J-M Asbestos Roofing direct from our nearest branch if your dealer won't supply you.

GET THIS CURIOSITY FREE

We want you to see the curious Ashestos Rock which yields the long, soft, pliable yet practically indestructible fibres from which we make J-M Asbestos Roofing, Theatre Curtains, Stove Mats and hundreds of other Asbestos products. We know it will convince you better than anything we can say that a roofing made of this indestructible stone must also be practically everlasting

Simply send a postal to our nearest branch and say "Send sample of Crude Asbestos and your handsomely illustrated Catalog No. 303."

The CANADIAN H. W. JOHNS-MANVILLE, CO., Limited

Manufacturers of Asbestos and Magnesia Products — ASBESTOS — Asbestos Roofings, Packings, Electrical Supplies, Etc.

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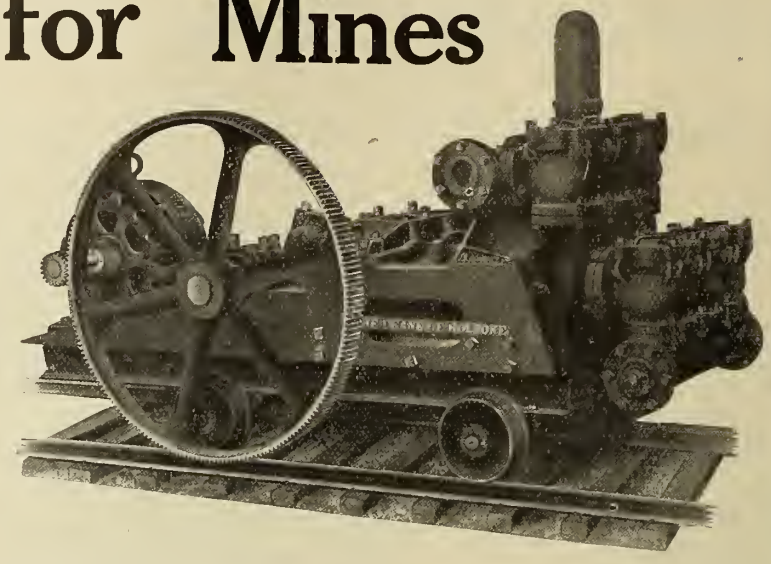
1364

Pumps for Mines



Whether for stationary or portable service, mine pumps must operate steadily when once started, and when idle be ready for instant duty. Pumps driven by

Westinghouse Motors

fulfill both of these conditions. They operate continuously for months without other attention than periodical filling of the oil wells.—They may be controlled from any convenient point, near or distant, and are ready for instant service at the throw of a switch.—No other form of drive for pumps is so flexible, efficient and economical as motor drive.—It eliminates all the disadvantages of steam drive.—No long, inflexible, leaky lines of piping to contend with.—A couple of wires convey electric current with practically no transmission losses.

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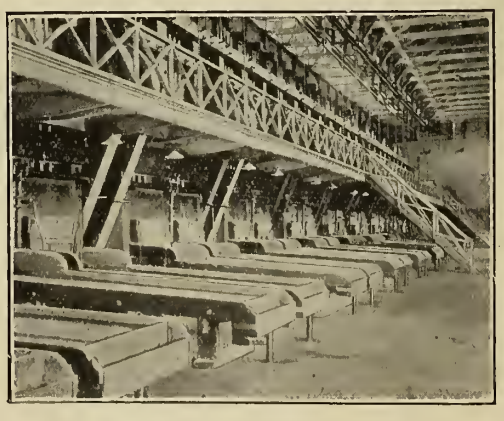

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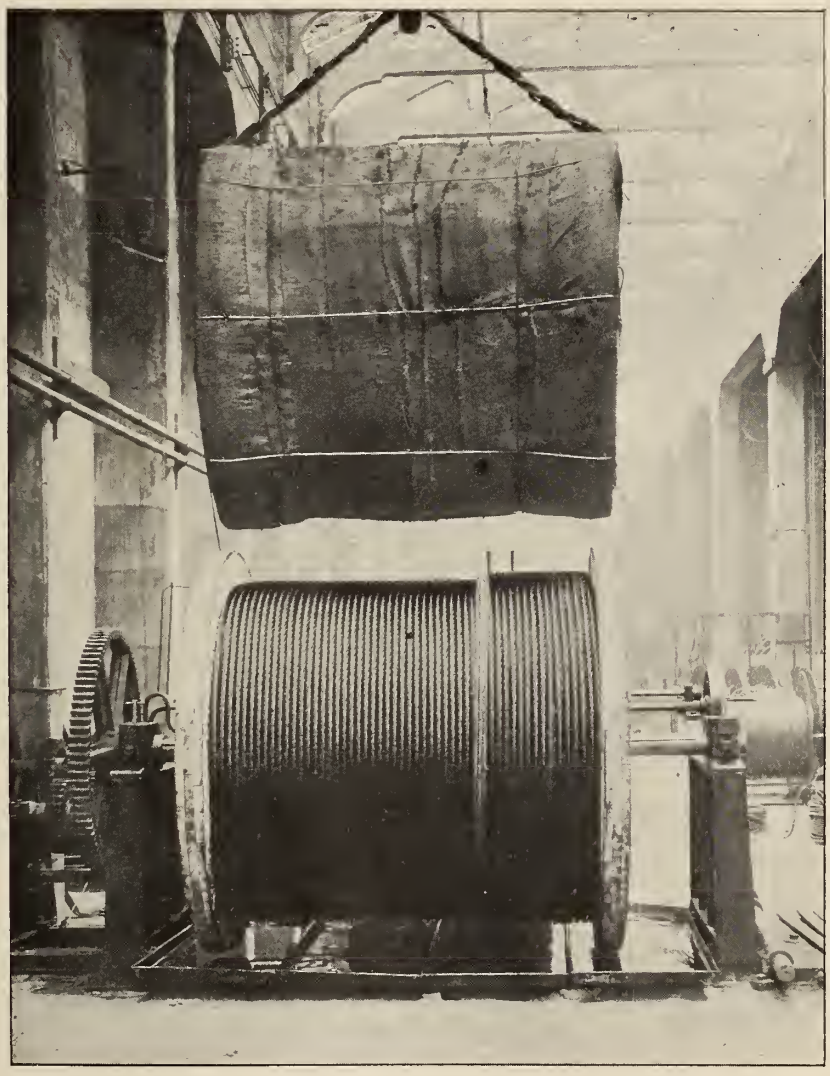

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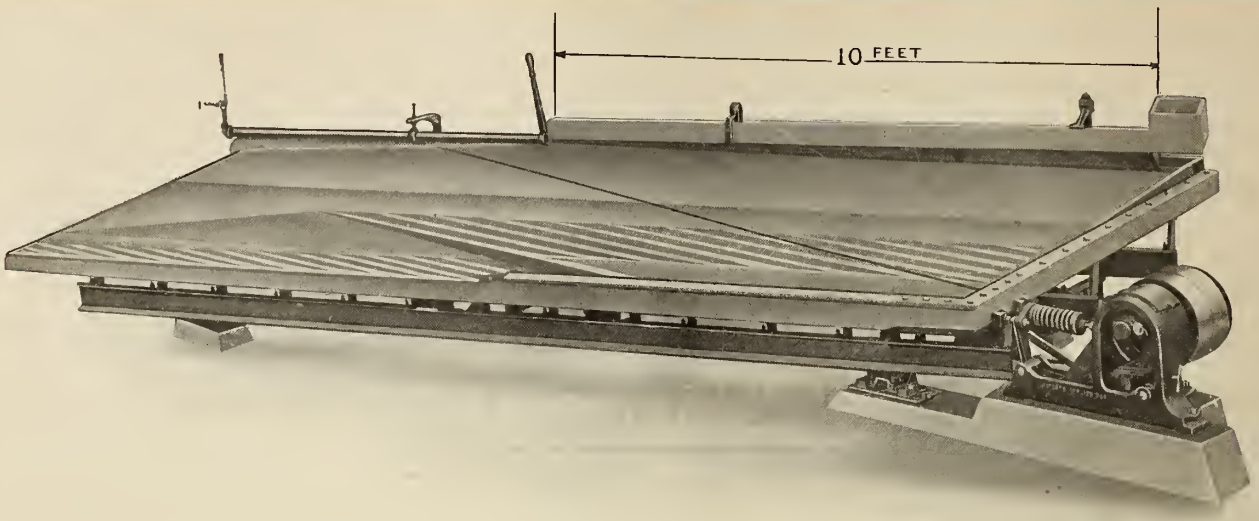

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The James Diagonal Plane Slimer Has Proven Its Superiority Over Its Competitors In The Cobalt District. This table is manufactured in New Glasgow, Nova Scotia, for the Canadian Market, and Newark, N.J. for the United States and Mexican Markets.

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THE CANADIAN MINING JOURNAL

VOL. 33 TORONTO No. 9

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The Qualities and Records of the

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Supplied in all sizes, from the Small Municipal Crusher to the Large Breaker

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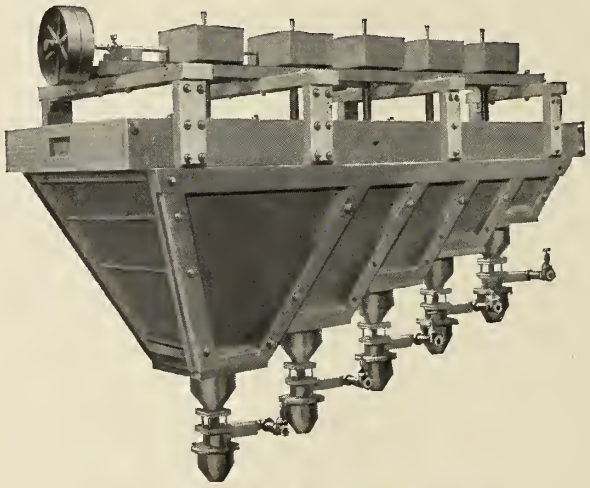
For

Efficient Concentration

Correct sizing has long been recognized as the basis of efficient concentration.

Screening is efficient in coarse sizing only. The limit to which screen sizing may be commercially carried depends upon the character of ore and water, but is seldom below 3 mm. to 5 mm. Beyond this limit, the cost of screen maintenance is prohibitive and the sizing unreliable.

This determines the field for hydraulic classification and makes a hydraulic classifier an essential element in a concentrating plant.



Standard Five Compartment Classifier.

The Richards-Janney Classifier was designed by Mr. F. G. Janney, Superintendent of Mills, Utah Copper Company, to answer the very definite purpose of raising capacity and recovery and lowering milling costs in a mill which handles a large tonnage of extremely low grade ore. The machine was made to embody the well-known Richards hindered settling principle and all of the practical Janney features of intermittent discharge, retardation of flow, controlled settling and hydraulic regulation. It was designed for continuous operation with little attention, high efficiency of classification, ease of adjustment, low water consumption and high capacity. The classifier was adopted as part of the regular equipment of the Magna Mill of the Utah Copper Company and seventy-six machines were installed. The result of their operation was an immediate increase of almost 100% in mill capacity with the same building and concentrating machines, a decrease of milling costs and an increase in recovery.

These machines have been operating continuously for over two years and have shown uniformly successful results. *For further particulars see Bulletin 1800.*

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By the New Type

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Never Been Approached by any similar machine for speed of boring, lightness and durability.

Bores any material from Fireclay to the hardest Rocks known.

Speed of boring, *5 to 50 inches per minute*, right through a 6-foot hole.

Can be handled anywhere and in any direction by any one man.

You must buy from specialists, you cannot afford to use any machine but the "**Hardy-Simplex**" in Metal Mines, Coal Mines, Railway Construction Work, Shaft Sinking or Quarrying.

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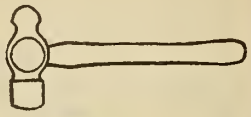
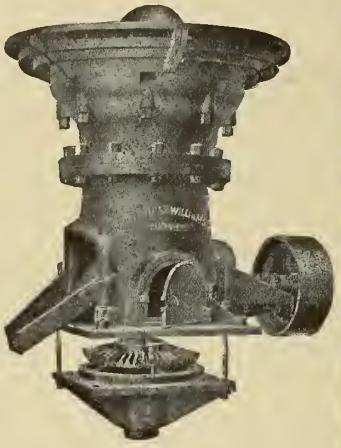


IN HERE

In Your Crusher

and have it



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without injuring your Crusher

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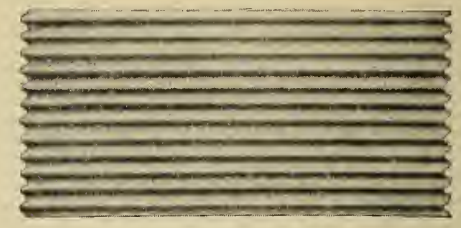

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Light Weight Drilling Speed Long Life Air Economy

These are some of the features of the new Sullivan "FF 12" "Lightweight" Rock Drill which deserve your close investigation. The "Lightweight" is the most powerful rock drill ever built for operation by one man.

Cylinder diameter, 2 5-8 in.
Weight, 155 lbs.
Drills holes up to 10 feet.

New Bulletin, 666-F

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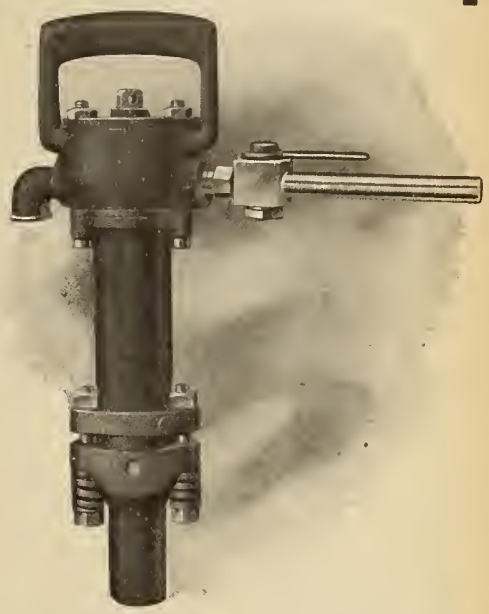
"Butterfly Valve" Hammer Drills.

The "Butterfly Valve" hammer drill is a product of this vast experience. It is a light rock drill which will save time, labor, power and repair costs.



"B C-26" Hammer Drill—with Combined Rotating Handle and Throttle

"B A-23" Hammer Drill—with Broad Tee Handle. Weight 43 pounds

It saves time beecause there is no time wasted in setting up.
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It saves power because the principle is right and all energy is used in actual cutting of rock.
It saves repair costs because it is simple, has few wearing parts, little friction and long life.

Our plant is perfectly equipped for producing the highest grade of hammer drills. With our up-to-date, modern machinery, run by experts, coupled with our designs and our facilities for treating materials, it is easy to understand how we turn out such excellent tools.

RAND tools are made with a view to giving our customers the very best article on the market. They are made in a variety of sizes as described in pamphlet K-68.

If you have not seen this pamphlet, please write for it to-day.

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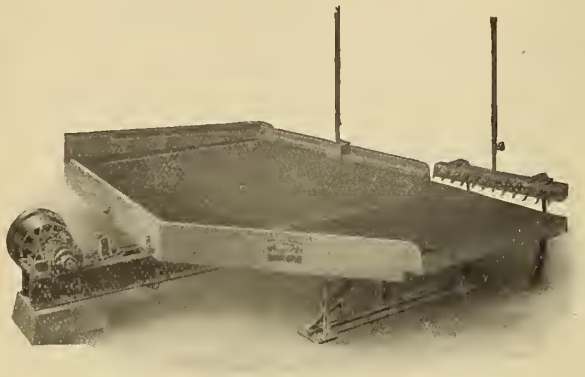

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No. 4 Deister Sand Table.

Deister Improved No. 3 Slime Table for classified and unclassified feeds of 80 mesh and finer only.

Deister No. 4 Sand Table, better adapted to feeds from 8 to 80 mesh, classified or unclassified, than any device on the market.

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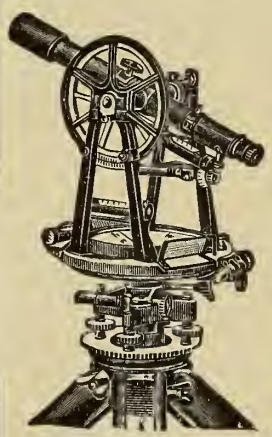

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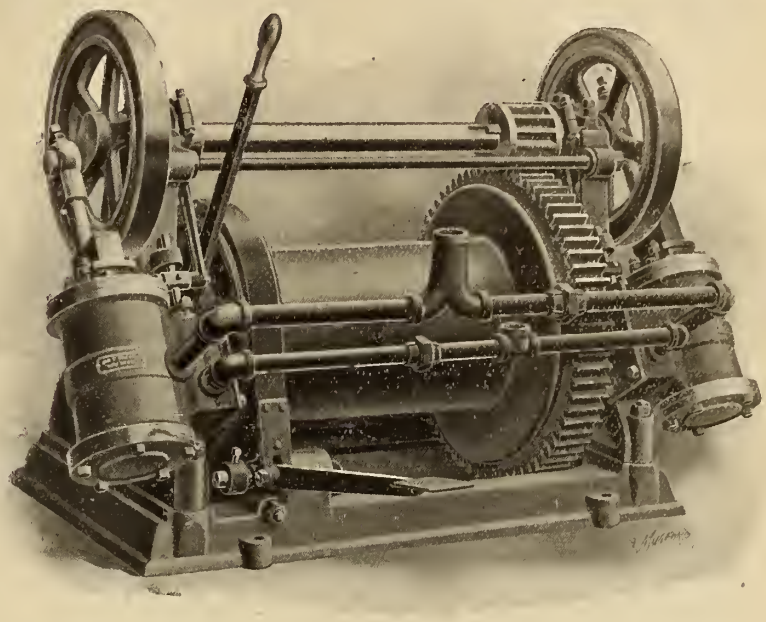

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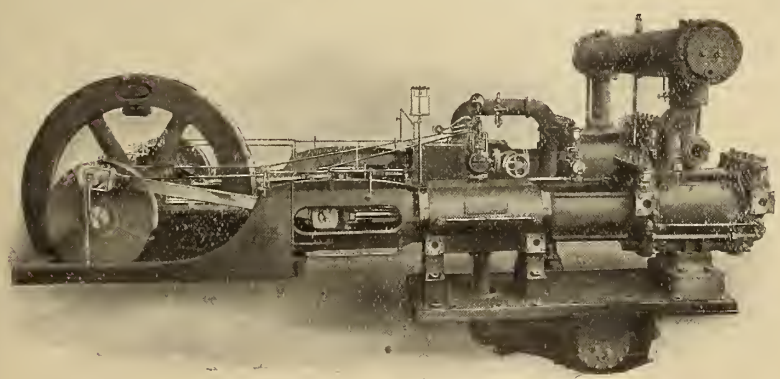

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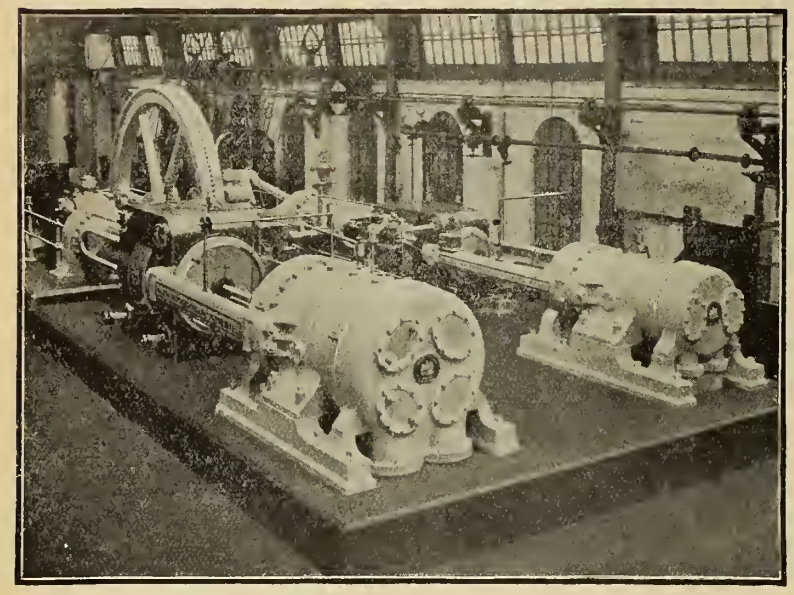

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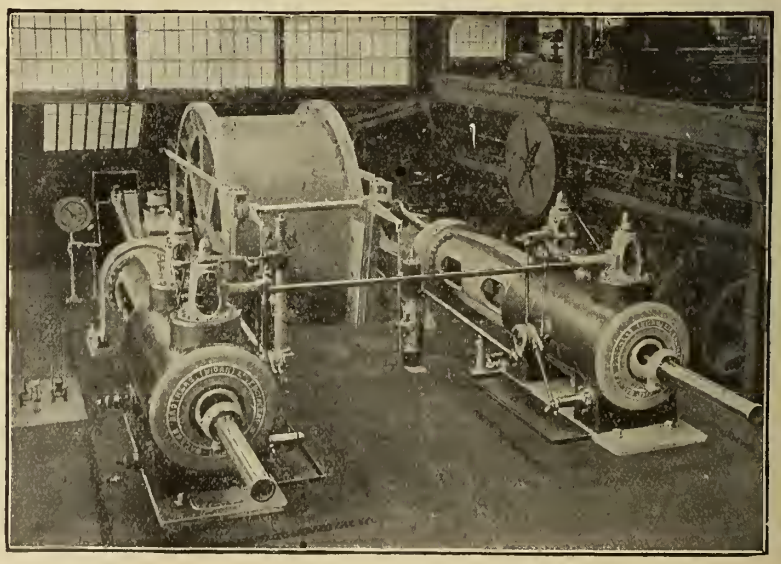

A pair of Horizontal Winding Engines, with Steam and Exhaust Valves respectively of the Drop and Corliss Types

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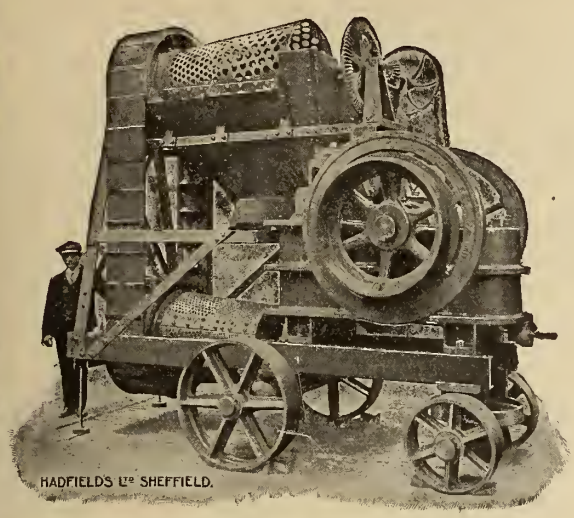

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HOME OFFICE, - - - TORONTO

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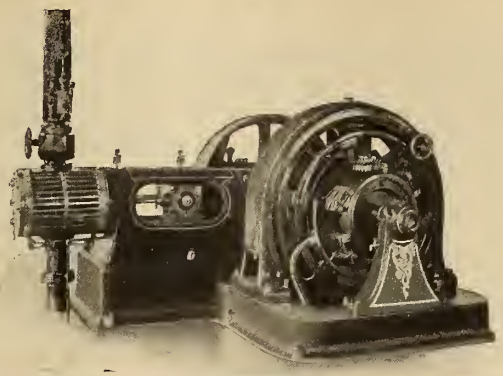
McEWEN

High Speed Automatic

ENGINE



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That's our slogan.

We not only promise it. We guarantee it. Listen!

"The engine shall not run one revolution slower when fully loaded than when running empty and a reduction of boiler pressure from the greatest to that necessary to do the work will not educe the speed of the engine one revolution. Any engine failing to meet this guarantee becomes the property of the purchaser upon the payment of one dollar.

In plain English this means "Perfect Engine Regulation or Your Money Back."

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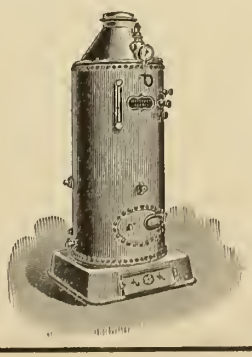

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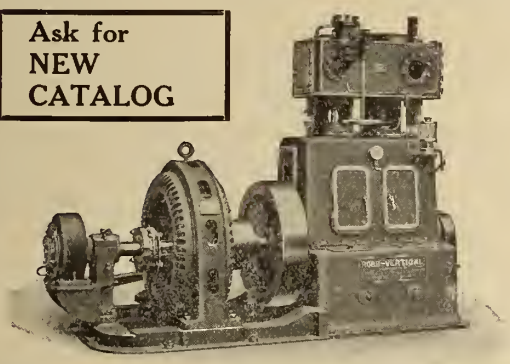

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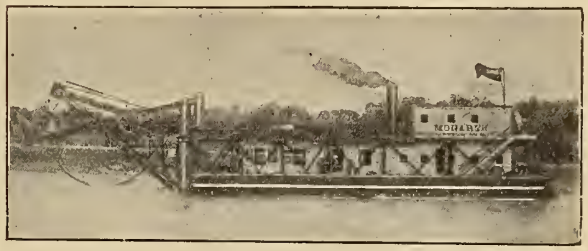

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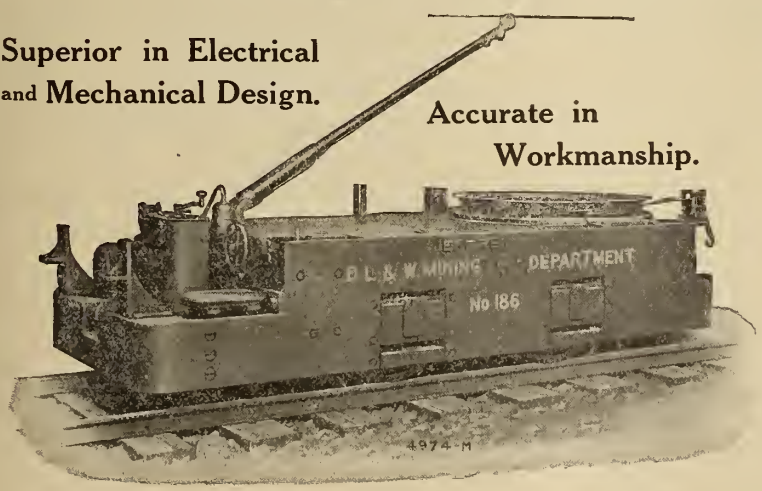

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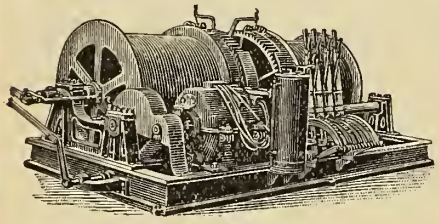

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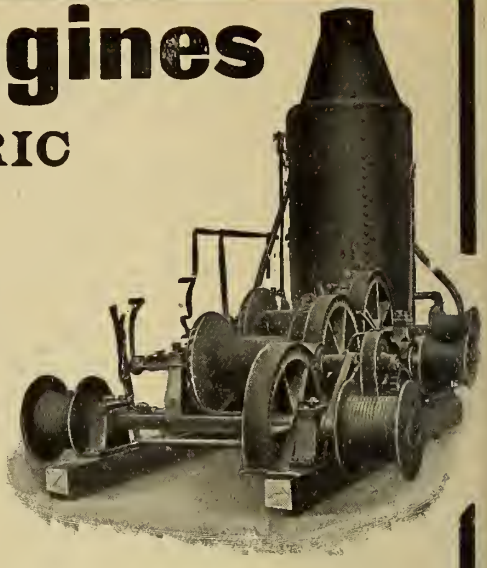

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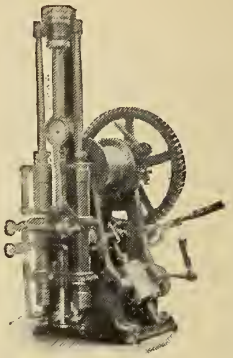

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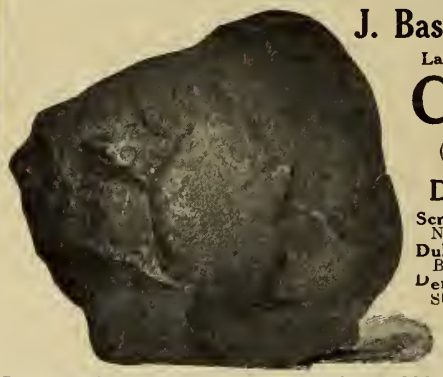

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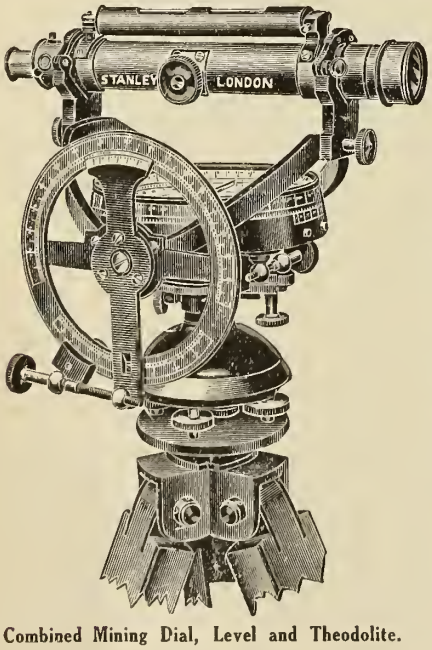

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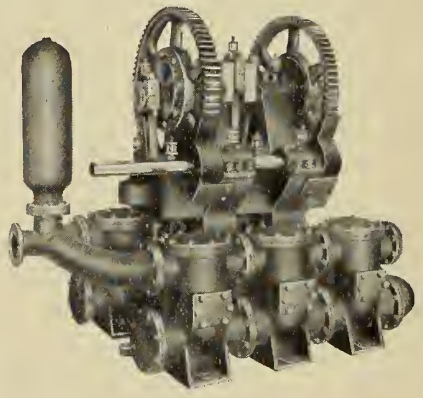

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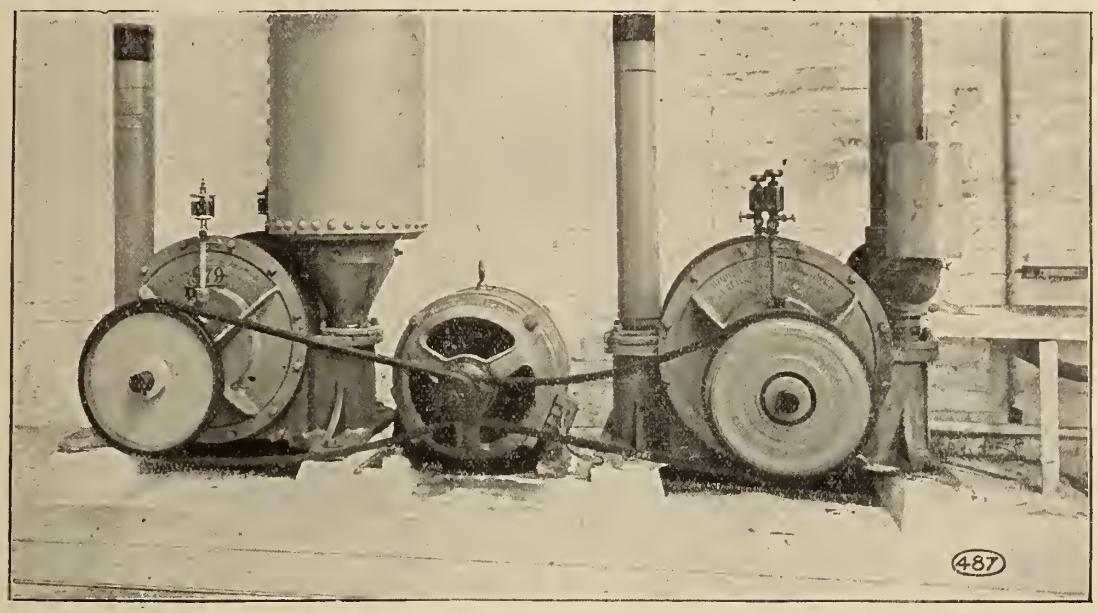

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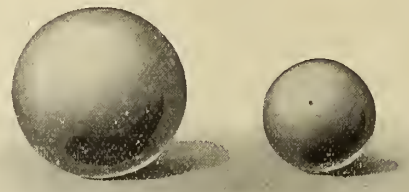

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VOL. XXXIII. TORONTO, May 1, 1912. No. 9

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REMOVAL NOTICE.

The offices of the "Canadian Mining Journal," on and after May 15th, 1912, will be Room 36, Canadian Birkbeck Building, 10 Adelaide Street East.

STUDENTS' COMPETITION

FURTHER ANNOUNCEMENT.

Our issue of April 1st contained the announcement of an offer of one hundred dollars ($100) as a prize for the best technical essay or descriptive article submitted by a mining student or by a recent mining graduate.

The following conditions must be complied with: Competitors must be regular third or fourth year students whose standing is satisfactory; or mining graduates of the years 1911 or 1912. Students who are taking a partial course will not be eligible.

All manuscripts submitted should be typewritten on suitable paper, and carefully bound and wrapped. No written manuscript will be considered. Drawings, such as plans and diagrams, must be made on tracing paper, or white drawing paper, in black ink. All lettering must be made large enough for reduction to suit these pages. This applies to the drawings themselves, which should be done with a view to clearness in engraving. Where a scale is included it should require no change on reduction. Photographs should have a glossy finish.

No restrictions are suggested as to the subject-matter of the essay, except that it must bear upon Canadian mining or metallurgy. The length of the essay is left to the discretion of the competitors.

Clear grammatical English, devoid of superfluities, will count largely in the award.

All papers should be handed in not later than November 15, 1912.

All manuscripts submitted will become the property of THE CANADIAN MINING JOURNAL, and, with the exception of the winning essay, if published, will be paid for at regular rates.

THE DOMINION DEPARTMENT OF MINES.

For some time the conditions under which the work of the Department of Mines at Ottawa has been carried on have been unsatisfactory. The Department, which includes the Geological Survey Branch and the Mines Branch, was, until April 1st of this year, under the

jurisdiction of the Minister of Inland Revenue. On that day it was transferred to the Department of the Interior, under the direction of the Hon. Mr. Rogers. It is hoped and expected that this will be a change for the better.

The Minister under whom the Rt. Hon. Mr. Borden has placed the Department of Mines has now an opportunity to do great service to the mineral industries of Canada. When he needs advice as to the administration of a department of mines he has but to consult his colleague, the Hon. Mr. Cochrane, whose regime as Minister of Mines of Ontario has left a lasting impress upon that province's extensive mining interests. Whatever differences of opinion may obtain as to the handling of such problems as the Gillies Limit, it is a fact that in this incident, as in others of a like nature, the Hon. Mr. Cochrane's policy was characterized by courage, foresight, and a notable disregard of practical politics. His generous treatment of the Ontario Bureau of Mines made possible the exceedingly satisfactory work accomplished and the high standing attained by that body. In no instance has politics been permitted to interfere with the Ontario Bureau of Mines.

And political interference, especially the appointment of men to the staff on account of party affiliations, is fatal in a technical department. If the Hon. Mr. Rogers is satisfied that he has the proper men as heads of Branches, then he should follow their advice. Only they can advise on the selection of qualified men for the staff, on the advancement or dismissal of others, and on the work to be undertaken.

Undoubtedly some reorganization should be begun at once. There are officers to whom superannuation is due. To prevent friction and overlapping the respective spheres of the Survey Branch and the Mines Branch should be more closely defined.

In Canada the mining industry is now second in importance. Agriculture is the only industry that means more to the country at large. Since fully one-third of Canada offers no possibilities except the opening up of mineral deposits, and since, even in the older provinces, mining is only in its infancy, the Hon. Mr. Rogers has a unique opportunity of benefitting his country by wise administration of a Department that has never yet been properly managed.

May his success be all that mining men hope for and that the country needs!

THE COALS OF CANADA.

Nearly six years ago a thorough investigation of Canadian coals and lignites was begun by the Dominion Government. The Dominion Department of Mines was not then in existence, and the work was placed under the official supervision of the Geological Survey, of which Dr. A. P. Low was then director. On account of the fact that the Mining Department of McGill University was well equipped, and from the further consideration that the government possessed no suitable laboratories, the work was assigned directly to the University, and Dr. J. Bonsall Porter was requested to make all arrangements necessary for an exhaustive investigation. After the organization of the Mines Branch, the investigation was transferred officially to that sub-department, the whole routine, however, being still arranged from McGill.

The research was conducted with a view to cover the taking of samples in the field, crushing and preparing them; washing, and mechanical purification; coking; steam tests; producer and gas engine tests; chemical work, and miscellaneous investigations. Dr. Porter was assisted by Mr. R. J. Durley, Mr. Theo. C. Denis, Mr. Edgar Stansfield, and a large staff of special assistants.

Carefully taken samples of representative Canadian coals were secured from mines in Nova Scotia, New Brunswick, Saskatchewan, Alberta, British Columbia, and Yukon Territory. The methods employed in testing these samples were ingeniously devoted to reproduce commercial conditions, particularly in the testing of coke.

Dr. Porter's general introduction, in which is outlined the scope of the enquiry, is followed by a comprehensive descriptive review of Canadian coalfields by Mr. Theo. C. Denis. In this section Mr. Denis has condensed a large amount of information gleaned from many sources, and has added thereto much fresh material. To the description of each mine from which samples were taken are affixed the reference numbers of those samples. This chapter is probably the most useful summary of the subject that has yet been published.

Part III., written by Mr. Denis and Mr. Stansfield, describes the precautions observed in taking samples and the manner in which they were taken. Many of the representative lots were over five tons in weight; while a few did not exceed 100 pounds. The essential history of each sample is given.

In Part IV., Dr. Porter outlines the process of sampling in the testing plant and laboratory; and in Part V. he presents a resume of the mechanical preparation of coal, a subject with which he has been long conversant. The results of many laboratory washing tests are appended.

Mr. Stansfield and Dr. Porter are responsible for the concluding section on the manufacture and testing of coke. Coking tests were made in specially contrived iron boxes which were placed in the ovens at the plants of five large Canadian companies. The results obtained throw light upon several important questions, such as the effects on coke of exposure to weather, the effect of time of coking, the effect of compression, and the effect of moisture. All of these results are syste-

matically tabulated. Five large general maps are attached.

This is the first volume of a series of six. The second volume, which will appear presently, is devoted to reports by Messrs. Durley and Stansfield on mechanical and laboratory tests. The remaining volumes are to be confined to tabulated records and details of the work summarized in the first two. The first two volumes, therefore, form a complete history of the investigation. The remaining four give to the technologist full data that will hardly appeal to the public.

Any such voluminous report as the one under consideration is open to criticism both as to plan and as to execution. The technically trained reader will find much that is elementary and much that can be found in trade catalogues. But, on the other hand, the intelligent lay reader will discover little that he cannot readily understand. And it must be borne in mind that the object of Dr. Porter and his associates was so to epitomize the technology of coal cleaning and coke making as to give the untrained reader a clear view of this important branch of industry. Without this epitome the reports of the laboratory tests would have been meaningless to the mass.

The Government's intention was to publish a report that would be alike informing to the engineer and instructive to the laity; and that would comprise all securable facts as to the economic value of Canadian coals. This object has been kept clearly in view. Limited appropriations, and other restricting conditions, tended to modify the scope of the investigation as it progressed. Nevertheless when the six volumes appear there will have been added to official Canadian literature a monumental contribution that will see years of good service and will always remain a sound work of reference.

THE MINING INDUSTRY AND THE T. & N. O. RAILWAY.

As a Government enterprise the Temiskaming and Northern Ontario Railway has played a most important part in the development of the country that it serves. Just how important that part is, cannot be better realized than by a perusal of the annual report of the T. & N. O. R.'s mining engineer, Mr. Arthur A. Cole. Mr. Cole has long been the philosopher, guide, friend, statistician, and general information bureau of Cobalt. His activities nof take a wider range, comprising Porcupine and the outlying districts.

The present report, for the calendar year 1911, is noteworthy for its fund of statistics and information, and, incidentally, for several references to the relation of farming to mining. To these we shall refer later. Meanwhile, let us glance over some other salient points.

In the Cobalt district, and this includes Gowganda and South Lorrain, silver to the value of $16,500,000 was produced in the year 1911. The total production to date is valued at about $65,000,000. Thus in eight years Canada, through the mines of Cobalt, has assumed third place in the list of the world's producers.

The largest yearly tonnage of ore shipped was reached in the year 1910, when, roughly, 34,000 tons were transported from the camp. The corresponding figure for 1911 was 24,921.71 tons. The current year will probably witness a further diminution of tonnage. The explanation is, of course, obvious. The operation of more and more concentrators, and the increasing tendency to reduce rich ore to refined bullion, are the factors in the case. Whereas in 1910 only $501,815.33 was shipped as bullion from the district, during 1911 the bullion shipments amounted to $2,012,428.95. Formerly, too, low-grade ore was shipped in quantities about twice as great as the shipments of high-grade.

Last year the opposite was the case, 283 cars of high-grade ore (ore containing more than 500 ounces) being shipped as against 140 cars of low-grade. During the year, 381,870.97 tons of ore were milled, the concentration ratios ranging from 18:1, to 108:1. Fifteen mills were in operation, and two are under construction.

In Mr. Cole's opinion, and he is well qualified to judge, Cobalt is on the crest of a wave that will not subside for some years to come. The subsidence, when it begins, will be gradual. Much depends, naturally, upon the condition of the silver market, which market has been favourable for some time. What a good price for silver means to Cobalt may be judged from the fact that a rise of one cent in the market quotation adds to the camp's income at the rate of about $325,000 per annum.

Dividends paid since the birth of Cobalt reach the grand total of $31,671,622, to which amount the mines contributed $8,958,047 in 1911.

Freight rates to Canadian smelters work out at from $4 per ton to $10 per ton. To United States smelters the charges are correspondingly higher. From Cobalt to Hamburg, Germany, the seasonal rates range from about $13.50 per ton to about $15 per ton.

The smelting situation is practically unchanged. Canadian smelters treated 34.02 per cent. of the ore, all of which was high-grade. United States smelters purchased 65.13 per cent. of the ore, which proportion included the remaining high-grade and all the low-grade. Only a small quantity was shipped to Germany, and none at all to Great Britain.

The advantages of cheap hydraulic and electric power are seen when it is noted that the coal consumption in Cobalt has been cut from 105,416 tons in 1909, to 44,216 tons in 1911.

Mr. Cole makes brief reference to Porcupine, in which he points out the debt owed by that camp to Cobalt. He adds a paragraph on the healthy progress being made in Swastika, Munro, and Larder Lake.

. . . . . .

In his eoneluding remarks Mr. Cole alludes to the fact that Cobalt was opened up by a railroad intended to exploit the farming lands of the north. "If the railroad," he eontinues, "had been entirely dependent for its tonnage on the agrieultural resourees of the country, it is quite probable that the train service . . . . would eonsist of a mixed train every alternate day, instead of, as at present, two through passenger trains daily, with sleepers and eafé-cars and local trains where required. The reason for the differenee lies in the fortunate diseovery of produetive mining camps in the vieinity of the railway."

The prospeetor "is the true pioneer, ... his word acts like magie in ealling to his side a host of eager followers. Along with these, or elosely following, comes the miner. All these men together form an army that is absolutely dependent on outside sourees of supply. As sueh, it forms a strong magnet for a farming population, if only the right kind of land can be found in the vieinity. . . . . What greater inducement could be offered to a farmer than rieh land in the vieinity of a large eash market, where good priees are paid for a good artiele supplied. These are the eonditions that rule in the Cobalt distriet." Further to illustrate this point, Mr. Cole adduces figures showing that food supplies to the value of $485,593 were used at the mines of Cobalt alone during 1911. Sinee there were 3,020 employees, this implies that the eost per man per day was 44 cents. In addition, the sum spent on the horses used by the mines was $17,391. It is to be noted that the miners form but a relatively small part of the population, and that there are many other towns and mining eamps to be supplied.

In the statements quoted, Mr. Cole is making no speeial plea; he is merely presenting faets. It is beyond question that Northern Ontario owes its prosperity to the prospector and the mine. Mining is the industrial skeleton of the region. Farming will elothe that skeleton with flesh. Mining has rendered neeessary the eonstruetion of well-equipped railroads. The farmer will reap the full benefit when, in years to eome, his markets expand.

The obvious moral is that the Government can best assist the whole eommunity by making easy the way for the prospector and the miner.

Mr. Cole's report is timely. It should be given wide publicity.

THE TWENTIETH ANNUAL MEETING OF THE MINING SOCIETY OF NOVA SCOTIA.

On the 27th and 28th of March the Twentieth Annual Meeting of the Mining Soeiety of Nova Scotia was held at Halifax. The annual dinner, on the evening of the 27th, was, like its predeeessors, a happy and important event. The newly elected president of the Canadian Mining Institute, Dr. A. E. Barlow, and Mr. R. W. Brock, direetor o fthe Geologieal Survey, were among the guests of honour.

During the dinner several speakers referred to Mr. T. A. Rickard's report on the gold mines of Nova Scotia. The referenees eonsisted mainly in veiled allusions and humorous touches. At a previous meeting, also, the matter was brought up and a resolution was passed requesting the Nova Scotia Government to furnish a eopy of the report.

Both the dinner and the meetings were well attended. But it is hardly to be expeeted that more definite results will follow these gatherings than have followed the annual meetings for some years past. The Mining Soeiety and the Nova Seotia Government are waiting for things to happen. It is the duty of both first to elear the atmosphere as to the Rickard incident, and then to get down to the business of developing the mineral deposits of Nova Seotia. The Government appears to be eontent to receive more than half its revenue from the eoal mines of the Provinee and to let everything eoneerned with good mining go by the board. The Mining Society enjoys a year-long slumber, waking only at the sonnd of the dinner bell.

Nova Seotia must help itself before others can do anything for it.

THE STRIKE AFTERMATH.

Utterly impossible as it will always be accurately to estimate the full damage inflicted upon Great Britain by the reeent eoal strike, yet trade returns, already made publie, reveal the magnitude of eertain immediate losses. The eoke and coal exports from Great Britain for the month of Mareh, 1911, were valued at £3,186,000; while for the month of March, 1912, the exports fell to £1,132,000. For the first time in eight months, also, the total exports of British products showed a falling off,—a falling off small in itself, but significant as oecurring during a period of general expansion.

In short, the coal miners have succeeded in securing the eoneession of a prineiple at the expense of alienating the whole nation. Fourteen million pounds sterling lost in wages, and depleted Fedcration funds are other items of loss. The total gains were the minimum wage, and the establishment of District Boards.

The miners have exereised eertain preseriptive privileges without eonsidering for a moment any interests but their own. They have lost in prestige and in pocket, and, we sineerely hope, will suffer a eurtailment of the political privileges that they have so wantonly abused. We do not doubt that by proper means they could have plaeed themselves in the long run in a mueh better position.

That the "general strike" is unneeessary, immoral, and wantonly eruel will be eonceded by all who are capable of giving the matter disinterested considera-

tion. The local strike is sufficiently barbarous, and plentifully effectual when the funds of a federation are available for its support. The employer and the employed can fight to a finish without disturbing the equilibrium of a whole nation. But for any one class of workers, many of whom are entirely satisfied with their work and at peace with their employers, to band together to terrorize a nation is anarchy.

As with the British railway men last year, so with the coal miners, the object has been to starve forty or fifty million people so as to bring irresistible pressure to bear upon a limited group of individuals. And by these means "rights" are sought! Surely, if the word has any meaning at all, the consumer, who, after all, pays for everything (including the strike) has "rights" to assert. And the consumer must see to it that those rights are considered.

. . . . . .

Through the history of the Eight Hours Act, through the history of the two great strikes, is distinctly traceable the influence of a disastrously weak Government. Political expediency made the Eight Hours Act possible—An Act plausibly sound *per se*, but singularly unadapted for immediate adoption into a sensitively organized industry. The recent strike, in which the Federation leaders disregarded the specific terms of standing agreements, was the fruit of the Eight Hours Act. Once again the British Government failed to vindicate the liberty of the individual workman. Once again political considerations overshadowed all questions of right and wrong.

In the most far-reaching sense, the coal miners of Great Britain are striving to establish a monopoly of a great natural asset. They, not the owner, are the autocrats. They have proved themselves able and willing to strangle the nation. How long is this power to remain theirs?

LEASING.

The gold mines of Nova Scotia, many of the prospects and abandoned mines of Ontario, and numberless mining properties in British Columbia await the advent of the "leaser." We have personal knowledge of several mines that have sufficient ore in sight to yield good net incomes if they were freed from corporation mismanagement. One instance will suffice.

A very promising deposit of a valuable mineral was discovered some years ago. The discoverer sold it outright to a lawyer, who, in turn, raised money to develop and equip the property. Certain complications arose as to marketing the ore. These were overcome. Then the owner ran short of money. He raised sufficient amounts from his friends to tide him over and, meanwhile, organized the enterprise into a joint stock company. To provide for the future he entered into a binding contract with a smelting company, whereby the mining company was obliged to deliver certain quantities of ore, of a certain tenor, at stated periods. Very soon his stopes were depleted, and, as development had not been pushed beyond immediate requirements, contract deliveries could not be filled. The smelting company promptly took possession of the mine. However, an enterprising third person had meanwhile discovered a technical flaw in the title and had instituted legal proceedings with the object of securing title to the right of mining for one of the metals contained in the ore. The result can be imagined. Endless suits and cross-suits were begun. At last a compromise was arranged between two of the litigants. But by this time the original owner had been completely shut out. At present the mine, which contains a considerable amount of workable ore, is lying idle. An experienced mining man, operating under a working lease, could put the plant in order, unwater the mine, and make money for himself and all concerned. This would, for one thing, put the mine in better shape for selling, and certainly would be a boon to the small community living in the vicinity. As matters stand at present, the mine is held for sale at a price that no sane engineer could approve, and the country is the poorer because of the stupidity and cupidity of a few wrong-headed persons.

This somewhat laboured instance may be taken as typical. Of course there are many prospects and mines that are not worth looking at. But it is often the case that a property is abandoned for reasons that have nothing to do with its merits. The competent, independent operator can, we are confident, find abundant opportunities of making money in Canada by means of the working lease.

PARRAL TANK SLIME AGITATION.

The evolution of slime agitation in cyanide treatment of gold and silver ores has been most marked in the last few years. Until recently, the Pachuca system of air-lift agitation through a series of connected tanks, represented the last word in cyanide practice. Perfection was not attained in the Pachuca, nor has it yet been attained. But in the Parral tank system, described by Mr. Bernard Macdonald in the April Bulletin of the American Institute of Mining Engineers, there are improvements that are worthy of note.

The Pachuca tank is a cylinder 45 feet high and 15 feet in diameter. The bottom is conical. The air-lift tube about one foot and one-quarter in diameter, is fixed in the centre of the tank and extends from near the bottom, to a few inches from the top. Compressed air is fed into the bottom of the air-lift tube, and is supplied also for agitation in the tank bottom. The discharge is placed a few feet from the bottom in tank when the feed is intermittent; and when the tanks are

continuous the discharge is well up on the side. Mr. Macdonald points out some mechanical defects in the Pachuca, particularly in the application of the compressed air.

These defects, Mr. Macdonald claims, have been eliminated in the Parral tank.

The Parral tank is 25 feet in diameter and 42 feet high. It is flat-bottomed and has a capacity three times as great as that of the Pachuca. The compressed air is admitted from four 12-inch pipes set 12 inches from the bottom. Instead of a rubber stocking, the air is admitted through patent nozzles fitted with a ball-valve, which open and close intermittently. Should the compressed air fail, there is no danger of clogging the air valves as they are automatically sealed by the ball. To the top-ends of the transfer pipes are fixed tees, and the pulp is discharged horizontally, setting up a spiral flow which gradually extends to the bottom of the tank.

These are some of the advantages claimed. Space does not permit us to dwell at length upon these. Suffice it to say that Mr. Macdonald asserts that the Parral tank, which by the way is his own child, does away with all the defects and most of the limitations of the Pachuca. A tabulated comparison of the two gives very easy advantage to the Parral. Extraction-curves, plotted from operations in both tanks, give results disadvantageous to the Pachuca in every case.

THE TITANIC.

Comment at this date from THE CANADIAN MINING JOURNAL upon the ghastly tragedy of April 15 may be considered superfluous. The newspapers of every country have given the fullest publicity to every painful detail. The awful event will serve to make navigation safer. As in mining, public sentiment must be stirred, and, sad to say, wholesale loss of life seems to be the only means of accomplishing that end.

It is appropriate to note here that the mining fraternity paid toll in the person of Mr. E. Sjostedt, well-known as a capable metallurgist and for a long time connected with large Canadian enterprises.

The insane desire for speed and for rapid returns affects every business and industry. The same governmental control that is being striven for as regards mining should obtain in transportation.

CASUALTIES.

Two deaths, one by asphyxiation, the other by inanition, have occurred in Porcupine. The Pearl Lake mine has been shut down, smothered by overground expenditure. In the Rea mine (we believe that this is, after all, a case of suspended animation) the sound of the drill is no longer heard.

Each must be diagnosed separately. The Rea mine has not been worked on its merits. In both cases those responsible should be brought to book.

EDITORIAL NOTES.

It is reported that the Granby earnings for the month of March were more than $100,000.

Mr. J. Thomas Reinhardt, of Porcupine Central fame, has blown up. The detonation was not heard in Canada.

The Dominion Steel Corporation has added largely to its fleet, the Black Diamond Line. Two motor passenger and freight steamers, and five colliers have been acquired. This should supply brisk coal shipments this summer.

The number of stamps dropping in the mills of the Witwatersrand in December, 1911, was 9,585 as compared with 9,135 in December, 1910; 242 tube mills were working, as against 185; and 4,514 rock drills, as against 3,380. The average number of tons of ore crushed per stamp per day increased from 7.43 tons to 7.99 tons. All of which is eminently satisfactory.

Satisfaction will be expressed at the news that Mr. J. B. Tyrrell has been requested by the Ontario government to supervise the task of determining the Ontario-Manitoba boundary between Island Lake and the mouth of the Nelson River. The selection of a strip of land 150 miles long and five miles deep, and the choice of two and one-half square miles of land as a terminal point for the T. &N. O. at Port Nelson, are in themselves responsible duties. To those Canadians who have knowledge of the north, however, Mr. Tyrrell's task assumes a weightier aspect. The Nelson River is one of the largest and most magnificent of our waterways. A future generation may see at the river's mouth a metropolis rivalling Toronto, Montreal, and Winnipeg. History is being made in the making of the new boundary.

THE GOLD FIELDS OF NEW ONTARIO

By Walter Baelz, Assessor of Mines.

(Translated by Dr. T. L. Walker* from Zeitschrift F. Prakt, Geologie, Vol. XIX, Part II., Nov., 1911, Pages 377-385.)

I. In General.

The discovery of gold-bearing quartz veins in the neighbourhood of Porcupine in 1909 is the most important made in Ontario since the discovery of the nickel deposits of Sudbury in 1886 and the silver veins at Cobalt in 1903.

As mining in the new gold belts is only beginning it will be necessary to wait for many years before being able to indicate the full extent of the gold region. At present, however, an examination of the work already done is sufficient to convince one that this gold occurrence deserves more than passing notice. On account of the promise of the Porcupine belt the Government of the Province of Ontario has recently built a railway line almost to the Metagami River and it is proposed later to extend it toward the west.

In comparison with the Porcupine district the earlier discoveries at Swastika and Larder Lake are relatively less important. The following report is in general based upon observations in the Porcupine district.

The most important information regarding the Porcupine gold fields contained in a report by A. G. Burrows entitled "The Porcupine Gold Area" was published by the Ontario Bureau of Mines in 1911. Many other reports have appeared in the technical press, particularly in the Canadian Mining Journal, published in Toronto. In addition to these the Bureau of Mines has already issued a reconnaisance map of the Porcupine district on the scale of one mile to the inch. This map indicates the geology in the vicinity of the Hollinger and Dome and is accompanied by a brief geological statement of Prof. W. G. Miller. Naturally, this map is not complete and in the later editions the topography and geology will appear in greater detail. I wish to add that Dr. M. Maclaren† very kindly indicated to me the geological relationships in the Township of Tisdale and further that I have had the benefit of the examination of numerous specimens by the Geological Survey at Berlin.

II. Extent of the Gold-Bearing Region.

It is not possible at present to definitely indicate the geographical boundaries of the region in which the gold-bearing quartz claims occur. Already about 10,000 claims representing an area of about 400,000 acres have been recorded. It must not be taken for granted that gold-bearing quartz veins occur on all of these claims—possibly some of the claims do not show quartz veins of any kind. On the other hand new discoveries continue to be made in districts in which valuable deposits were not previously known.

The most important deposits so far located lie to the east of the Metagami River in the Townships of Tisdale and Whitney, but recently discoveries have been made to the west of the Metagami in the Township of Bristol in the Cripple Creek district.

III. Topography.

The region is generally level or slightly undulating and possesses an average altitude of about 300 metres.

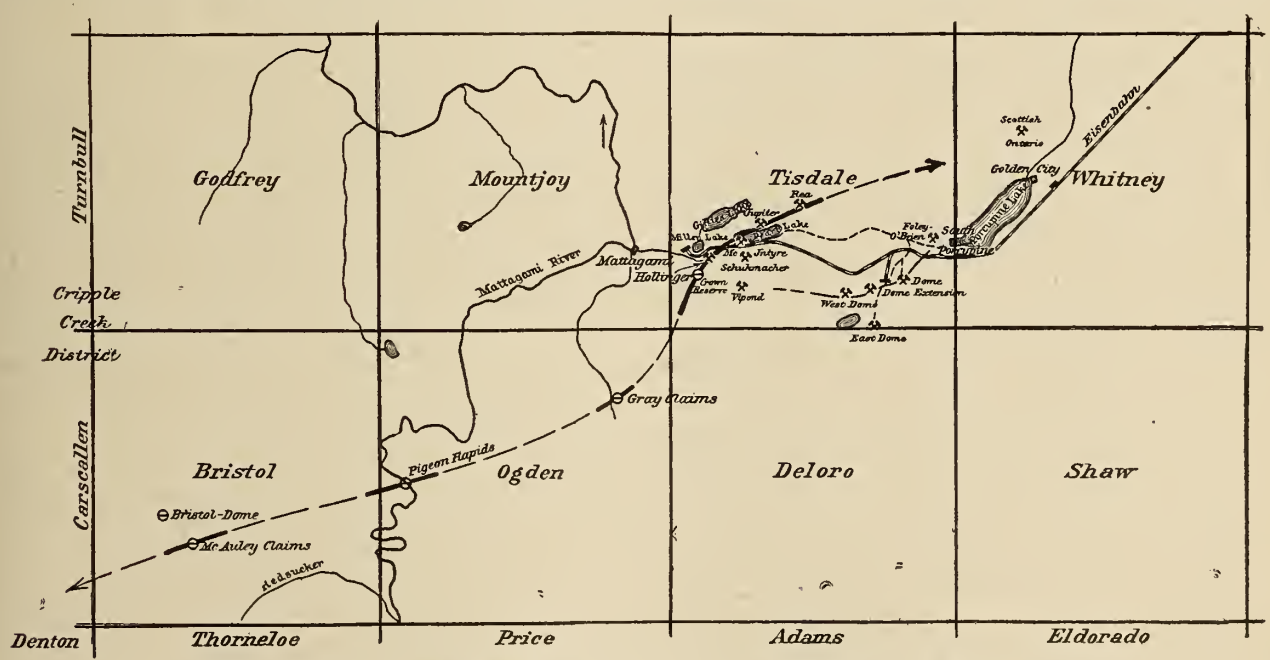


Fig. 2.—Most Important Outcrops in the Porcupine District

(The Townships shewn on this map as well as several adjacent Townships are almost all taken up as mining claims.)

— — The broken lines indicate the course of the Hollinger Dome Vein Zone.

⚒ Chief Shafts of the more important mines.

⊖ Some of the richer gold outcrops on the less developed claims.

*Professor of Mineralogy, University of Toronto.
†Author or "Gold, Its Geological Occurrence and Geographical Distribution."

The surface is usually covered with glacial boulders, sand and clay. Upon the compact clay a substance resembling turf is formed. The older rocks project through the younger sediments and form ridges which seldom rise more than 20 metres above the plain. In these ridges the quartz veins appear.

The region contains numerous lakes which vary from three to six metres in depth. The Metagami, which is the most important of the rivers, forms a wide sluggish stream when in the region of the recent sediments. Where, however, this stream cuts the altered rocks it forms rapids well suited for the development of electric power.

Until recently the whole district was difficult of access and covered with coniferous forests with thick moss. More recently forest fires have removed much of the vegetable covering and facilitated the work of prospecting in a remarkable degree.

IV. The Ore Bodies.

1. Geological Relationships.

The stratagraphical relationships of the country rock may be indicated as follows.

Quaternary.
  E.—Glacial.
    Gravel, sand and clay.
      Unconformity.
Precambrian (Algonkian).
  D.—Post Huronian.
    Younger diabase, usually containing olivine.
      Slight unconformity.
  C.—Huronian.
    Lower Huronian slates, graywacke and conglomerate.
Archaean.
  B.—Laurentian.
    Coarsely crystalline granite and granite gneiss.
  A.—Keewatin.
    Acid porphyry, frequently schistose.
    Older diabase with amphibolite and serpentine.
    Iron formation.
    Greenstone and Greenschists (Amygdaloidal basalts).

The Keewatin is the oldest and at the same time the most widely distributed formation of the district. In it the most of the gold-bearing quartz veins occur. It has been built up by a series of volcanic outbreaks. These volcanic rocks as they appear to-day are more or less metamorphosed. Sediments played in this formation only a subordinate role.

The greenstone is very abundant. It is light to dark green in colour and occurs schistose as chlorite schist, serpentine schist and sericite schist, which have been formed by the metamorphism of basic lava, tuff and ash. The Canadian geologists refer to the original rock as basalt or, in some cases on account of the cellular structure, as amygdaloidal basalt. The cells in this greenstone are usually filled with calcite.

The basalts are overlain locally by a deposit of iron bearing sediments. This iron formation, which is composed of alternate layers of magnetite and red jasper, occurs principally in the southern part of Whitney. It is regarded as equivalent to the Keewatin iron formation of Lake Superior.

After the deposition of the sediments occurred an eruption of diabase, as may be seen in Whitney Township. This older diabase is frequently altered to amphibolite.

The volcanic activity of the Keewatin came to its close with the extrusion of a mass of porphyry, usually acid. It occurs as felsitic quartz porphyry, but frequently, as in Delora, it appears in the form of coarsely crystalline granite porphyry. In the neighbourhood of Pearl Lake the quartz porphyry has been altered to sericite schist, which may be distinguished from the sericitic greenschist by its lighter colour.

The coarse crystalline Laurentian granite occurs in Porcupine in only a few places. It is very frequent in Swastika, where it frequently forms veins.

Unconformally upon the Archaean rests the sediment of the lower Huronian composed of conglomerate, greywacke and more rarely grey slate. The conglomerate carries numerous boulders, usually of granite. The Huronian represents only a small development because it has been partly worn down by glacial action. In contrast to Cobalt, where the Huronian conglomerate appears in only slightly disturbed arrangement, it is in Porcupine strongly folded and altered frequently into conglomerate schists containing flattened boulders. Before the close of the Precambrian there occurred an extrusion of olivine diabase and of other basic eruptives (Post Huronian), which occurs mostly in veins and are regarded as the equivalent of the similar diabase of the Sudbury region.

A part of the older rocks was carried away by the glaciers in their southward movement. Glacial clay and sand were deposited over wide areas, thus hiding the Archaean and Precambrian formations and the quartz veins which occur within them.

2. Age.

The gold-bearing veins cut through the Keewatin and lower Huronian formations, but are themselves intersected by the younger post-Huronian diabase. They are, therefore, either upper or post-Huronian in age and belong to the older gold formation.

3. Form and Composition.

The ore deposits seldom form simple veins with sharp contacts on the country rock, but rather form compound veins, sending out numerous stringers into the country rock. The strike and dip of the veins is very variable. Sometimes the veins are only a few centimeters across; on the other hand, they occasionally expand and form enormous quartz masses which, like domes, rise above the surrounding country. These vein formations seldom occur singly, but rather form series of veins and stringers approximately parallel, constituting a broad zone of veins. These extend for long distances in the direction of the strike and as they possess considerable width one is forced to assume for them great depth.

The veins usually strike west, southwest to east, northeast. In rare instances veins have been observed which strike south, southeast, to north, northwest, as may be seen at the East Dome mine.

The dip is often almost vertical. Frequently, however, the veins appear to be strongly faulted by later earth movements. Such a fault has been discovered in shaft No. 2 of the McIntyre mine.

The gangue consists for the most part of milky quartz and more or less silicified country rock. This quartz contains gas and liquid inclusions,** as well as feldspar crystals and fine needles of tourmaline. As a result of earth movements the quartz is much fissured and, consequently, easily broken. Along with the quartz, siderite and a brownish mineral with rhombo-

**J. Stanford: Microscopic Examination of Some Typical Specimens of Porcupine Rocks and Vein Matter, Canadian Mining Journal, 1911, p. 109.

hedral cleavage—ankerite (CaMgFe) CO_3—are fairly prominent. In a vein on the West Dome mine, ankerite is the chief mineral in which the quartz forms only slender stringers running across the vein. The vein body consisted therefore originally solely of carbonates and only after later movements in the old fissure did the introduction of the rising solutions carrying gold and silica become possible. A metasomatic replacement of the carbonate by quartz has been frequently observed. The ankerite sometimes carries a little gold, but this has been derived from the solutions which introduced the quartz. The appearance of ankerite in large proportions is not always a favourable

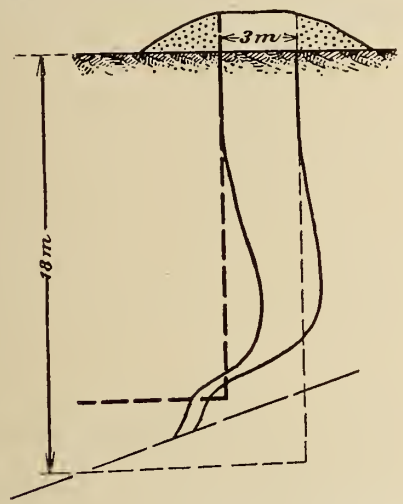


Fig. 3.—Faulting as shewn in Shaft No. 2, McIntyre Mine.

sign for the occurrence of gold values evenly distributed through the vein.

The chief metallic minerals are pyrite, marcasite, magnetite, calcopyrite and occasionally a little galena and zinc blende. In the veins in Bristol Township arsenopyrite plays an important role.

More than half of the gold contained in the veins and stringers occurs as native gold. This appears as a rule in the form of fine plates within the quartz, especially along the lines of contact between the quartz and the country rock. The remainder of the gold is combined with the sulphides and arsenides which form large mineralization zones in the country rock.

It is interesting to note that in the northwestern part of Tisdale the native gold occurs in serpentine asbestos, which along with actinolite and calcite is found as veins in serpentine. According to Dr. McLaren, this type of gold occurrence had been previously observed in only one locality—Western Australia.

Gold telluride occurs in small amounts in a quartz ankerite vein to the east of Larder Lake. Up to the present telurides of gold have not been observed in the Porcupine district.

No considerable development of gossan formation is present. The primary zone with milky quartz and undecomposed sulphide reaches almost to the surface. This is due to the fact that the glaciers have removed the oxidation and cementation zone—probably originally present—and that since the glacial period a sufficient time has not elapsed for the formation of extensive secondary zones. Only at the very surface may the decomposition of the sulphides and ankerite be observed. In this rusty mass the gold values are higher. This slight evidence of secondary enrichment is rarely marked at a depth greater than two to three metres.

From this point of view the exposures at the Jupiter mine are very instructive. Here the milky quartz containing scales of sericite and tourmaline needles is well banded with light and dark bands. It is well exposed from the surface to about fourteen metres below the ground water level, and is of a fairly uniform character. The gold, which is finely divided, may be seen without the aid of a lense, occurs in the native form and is scattered through the fresh quartz in such a manner that, notwithstanding the high values, one may not regard it as the product of secondary enrichment. Similar observations were made at the Hollinger mine which, at present, is the deepest in the district. Its shaft has attained a depth of about 60 metres, while its drilling operations have probably not exceeded 170 metres measured from the surface. It is just possible that this primary gold value may diminish with depth, as has been found to be the case in many mines in Western Australia. Inasmuch as the primary zone extends right to the surface the valuation of these ore bodies is considerably simplified.

It is very hazardous to value and purchase gold properties on the basis of surface observations, as is frequently done in the Porcupine district. It should not be forgotten that even in primary ore bodies bonanzas may occur represnting portions of the vein primarily enriched. These bonanzas must be considered along with large amounts of poor ore to be encountered in following the vein either horizontally or vertically. In order to be able to determine whether we are dealing with isolated portions of rich ore accidentally occurring near the surface and of larger or small extent, as much of the vein as possible should be uncovered. Diamond drilling should be undertaken and test pits sunk to the depth of at least 20 to 30 metres.

These explorations should be along the vein as well as across it, and at short intervals.

Such explorations are strongly recommended also on account of the constant variation in the size of the vein.

The distribution of the ore seems to be most uniform when the ore body occurs in strongly disturbed and fissured country rock. This is particularly true in the case of the schistose quartz porphyry. Under such circumstances the rising ore-carrying solutions could penetrate everywhere freely and consequently found numerous points of contact with the country rock. A belt of quartz porphyry of this kind, now largely altered to sericite schist occurs in the vicinity of Pearl Lake (Fig. 4). The quartz porphyry crops out through the glacial formations in the vicinity of Miller Lake and extends eastward on both sides of Pearl Lake to the properties of the Plenaurum and of the Bewick-Moreing syndicates, where, however, unaltered porphyry and greenstone may be observed in place. The metamorphosed porphyries are bounded to the north and to the south by old greenstones. It is a remarkable fact that the veins in the acid porphyry carry considerably higher value in gold than do the veins in the basic greenstones. This may be most readily seen on the northern contact where a vein exposed in the porphyry carried rich ore, but where it intersects the greenstone formations it becomes almost valueless. Here in the metamorphosed quartz porphyries around Pearl Lake the gold ores occur in such richness and in such quantity as is rarely seen in primary deposits in such a small area. Those veins which are not parallel to the schistosity, but which intersect it by a sharp angle, are to be regarded as the chief cariers of rich ore. The influence of the country rock on the gold-bearing values of the veins is more

marked at Pearl Lake than anywhere else in the Porcupine district. On certain other properties, however, such as the Dome, the Dome Extension, the McAuley claims in Bristol, schistose porphyries play an important part.

In refrence to the peculiar significance of this acid porphyry it may be well to point out that also in the Keewatin in the Province of Quebec, similar quartz ankerite veins have been observed, without, however, carrying any important amount of the noble metal. M. E. Wilson† considers that this lack of economic proportions of gold should be attributed to the complete absence of intrusions of quartz porphyries with which the occurrences of gold in Northern Ontario is apparently very closely connected. As a matter of fact in Northern Ontario such intrusions of porphyries have been observed to possess great extension, not only in Porcupine, but also at Swastika and Larder Lake

In the Porcupine district the Dome and the Hollinger mines are among the best known. The former deposit is the best representative of the dome vein type, while the latter deposit consists of a mineralized zone containing compound veins. The Great Dome of the Dome mines forms an irregular dome rising above the glacial deposit about seven and one-half meters. It is 180 meters long and 60 meters broad. This great body consists of several masses of milk-white quartz, some of which attain a diameter of 40 meters, and which, along with a net-work of veins and stringers, enclose large mineralized masses of schistose greenstone and of Huronian schist conglomerate. On the surface, in addition to the numerous sulphides, occasionally very handsome thin plates of native gold may be observed.

Since the gold veins of Porcupine vary, not only in dip and strike, but also in an unusual degree with regard to the thickness of the veins, it is scarcely probable that a mass of such enormous dimensions on the surface as the Great Dome, will be found to preserve such great magnitude with depth. I was not able to obtain definite evidence, however, on this point, since the shaft, which was then 36 meters deep, had been burned and on this account it was impossible to examine the underground workings.‡ According to data contained in Davis Handbook of the Porcupine District (New York, 1911), there is an ore supply of 600,000 tons§ (short tons). This has been determined by sinking shafts and other explorations. This ore contains on an average from 42 to 50 marks per ton in gold, or a total value of twenty-five to thirty million marks. (1 mark=24 cents.)

The Great Dome is part of a vein system which may be followed to the east and northeast past the Dome

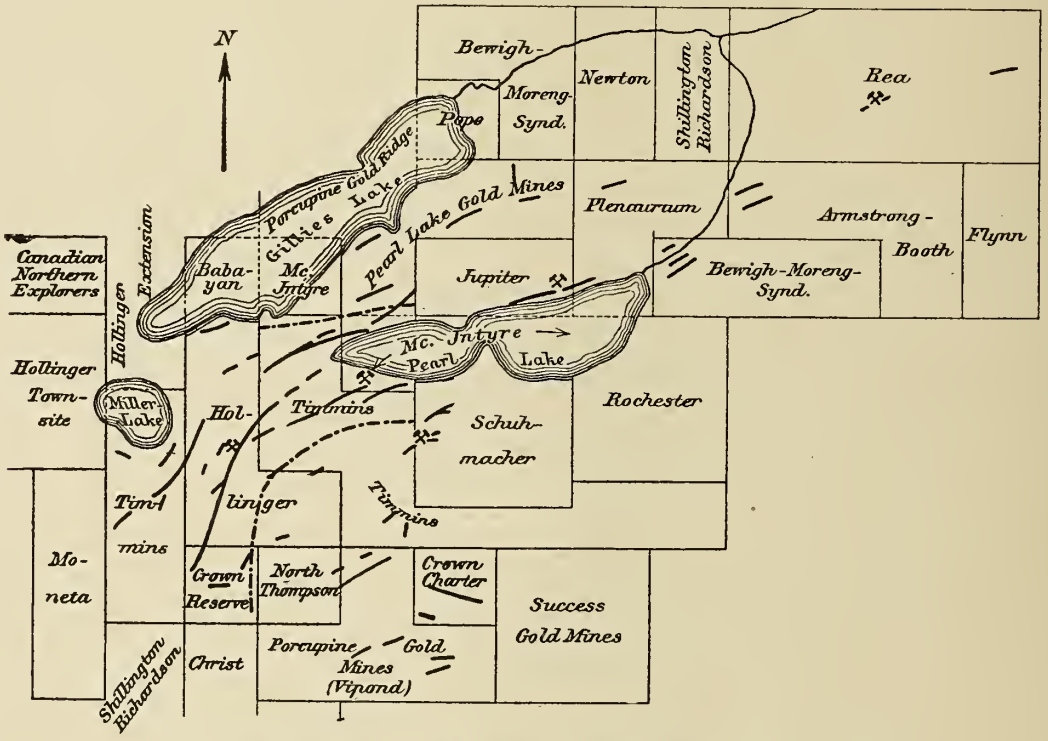


Fig. 4.—Sketch Map of the claims in the vicinity of Pearl Lake.

— — — Direction of the Veins in the mines shewing the greatest development.
—.—.— Contact between the Schistose Quartz Porphyry and the Basalts (Greenstone and Greenschist)—so far as known.

The favourable influence of the acid porphyry on the gold values cannot be of a genetic nature, since it is considerably older than the veins which are late Huronian. On the other hand, the chemical, and particularly the physical properties of this rock, which is easily altered by pressure to the schistose varieties, may be of considerable importance. "The more fissured and schistose the country rock the higher are the ore values" appears to be an important fundamental in estimating the value of these gold deposits. In the ordinary massive greenstone high values are not common, for in this hard and little fissured rock, the ore-bearing solutions were only able to ascend freely where the way was open to them by the steep, smooth walls of relatively wide fissures. Such favourable conditions have been observed only rarely, as for example in the case of the chief vein of the Rea mine.

†Summary Report of the Geological Survey, 1910, p, 206.
‡Permission to make an underground examination of this mine, which is controlled by the International Nickel Company, is under ordinary conditions difficult to obtain.
§In the following references the ton is understood to be the short ton—2,000lbs.

Extension mine to the Foley-O'Brien and toward the west to beyond the West Dome mine.

From the nature of this deposit as a whole it is apparently best suited for open cut work rather than for underground mining.

The Hollinger mine lies in the region of the Pearl Lake porphyry. The course of the vein at the Hollinger strikes nearly east, as may be observed in Figure 4. On the out-crop these veins have been usually examined by test pits and in this way the gold values determined. Underground explorations of a serious character have been undertaken only in the central and richest of the larger veins. The depth attained in this work does not exceed 60 meters. This chief vein is almost vertical. At the 30-meter level it was followed along its strike for 420 meters. On this level the thickness of the vein varies with a maximum of seven meters and an average thickness of the whole length, of two meters. The vein filling consists of quartz and some country rock. Up to the present ankerite has been found in only one place. Samples carefully taken from the vein throughout the whole length of 420 meters at intervals of one and one-half metres, show, according to the data of Mr. Robbins, superintendent of the mine, an average of 212 marks per ton.‖

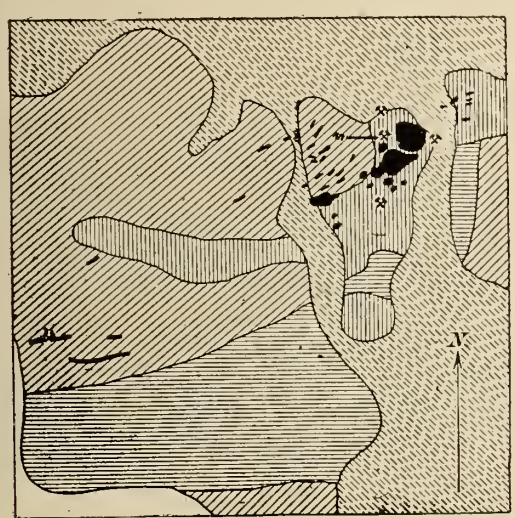


Fig. 5.—Geological Sketch of the Dome Mine

Quaternary—mostly glacial sediments,

Huronian and Keewatin—Lower Huronian Conglomerates and Schists,

Quartz Porphyry—mostly metamorphosed,

Greenstone—Amygdaloidal Basalts,

Quartz Veins and the Great Dome.

Similar explorations of the 60-meter level, where no great length has been opened up, have given results equally satisfactory. The gold occurs in the form of native gold, or in combination with sulphides. It is distributed throughout the whole body of the vein and does not show so rich in spots as in the case of many other mines. The country rock also carries high values which are greatest in the immediate vicinity of the quartz of the vein mass and stringers. As the whole country rock between the veins is a net-work of stringers and since this always contains traces of gold wherever there is the least sign of quartz stringer, it, therefore, appears as if the country ock between the various veins constituted a zone of mineralization. This zone attains a breadth of 420 meters on the properties of the Hollinger and of the closely related Timmins syndicate. Under present conditions ore occurring in large bodies and carrying 20 marks in gold to the ton may be mined with a profit. (1 mark=24 cents.) It seems, therefore, probable that a considerable part of this mineralized zone may be regarded as profitable ore.

Similar relationships are found to the northeast, at the McIntyre and Jupiter mines. Still farther to the northeast (Fig. 2), beyond the schistose porphyry the zone of veins appears to continue in the direction of the Scottish-Ontario mine. In this extension, however, the gold values are not so high.

A southwestern extension of the Hollinger vein zone was observed on the property of the Crown Reserve. Further extension toward the southwest can only be followed with difficulty, as the outcrops of the veins are frequently covered by enormous thickness of glacial material. The vein zone appears to include the free gold exposures of the Gray claims and of several adjacent claims. It then continues farther to the Pigeon Rapids of the Metagami River. A zone of veins has been observed in the midst of these rapids. This zone strikes in a northeasterly direction, has a width of 90 meters and on both sides of the river is hidden by a covering of young sediments. Assays of specimens broken off from under the water gave values in gold varying from two to 120 marks per ton. (One mark=24 cents.)

This exposure in the Metagami River caused many prospectors to seek for the continuation of this zone farther to the west and to the southwest wherever the older rocks were exposed. McAuley Bros. succeeded in June, 1911, in making a discovery in the southwestern part of Bristol Township. The zone of veins appears here in the form of a high ridge rising above the surrounding country and has been exposed partly by stripping and partly by blasting. In this way it has been uncovered for 140 meters in the direction of the strike. It is noteworthy that in this exposure a diabase dyke 12 meters across intersects the quartz vein and strikes in a north-south direction. This dyke of younger olivine diabase apparently occupies a fault fissure. To the west of this dyke the ore body, which is about 20 meters across, includes quartz, a little ankerite and some strongly pressed country rock. To the east of this dyke, however, two veins of similar dimensions are observed about 40 metres apart. The country rock between these veins contains numerous stringers of quartz, but it does not appear to be strongly silicified. The body of the vein exhibits throughout its whole length, exposures of free gold, sulphides, and arsenides of a promising character. Here the conditions do not appear on the whole to be quite so favourable as at Pearl Lake, since the country rock is not quite so schistose and is only in part made up of metamorphosed quartz porphyry. It will be necessary to await the results of assays of samples and underground development before one can judge as to whether this occurrence is really of a superior quality.

Gold has recently been found in a vein which may belong to the same zone, immediately to the south of the McAuley claims.

To the northwest of these claims I examined a quartz dome about 35 metres broad, 50 metres long, and four meters high. On the surface this showed absolutely

‖The other veins appear to be considerably leaner. They carry, however, according to preliminary investigations, frequently from 40 to 80 marks per ton. (1 mark=24 cents)

no sign of mineralization. In a small pit located on the east side of this dome, where the quartz contains numerous masses of the country rock, I observed some marcasite and arsenopyrite which gave promise of gold and which apparently increased in amount with depth.

The further extension of this gold-bearing belt to the southwest of the McAuley claims is seen in the remarkable arrangement—as indicated on the map of the Cripple Creek district—of all the free gold discoveries hitherto made in the Townships of Carscallen, Denton, and Keefer. All these discoveries are approximately in line with the west southwestward extension of the Hollinger belt.

This Hollinger belt extends in the direction of the strike for at least 50 kilometers. It represents a strongly foliated zone inside of which the gold-bearing solutions were able to find a most convenient way in their ascent. In this belt are found the majority of the promising deposits—the Great Dome, while appearing to lie outside of this zone, may possibly be regarded as an offset. Inside this zone, however, the deposits appear to be particularly rich where this tectonic zone intersects quartz porphyries and their foliated derivatives. I do not wish to be understood to maintain that promising discoveries have not been made in other parts of the district or that they will not be made in the future or that other zones of the same kind may not be established. The Hollinger zone is nevertheless of the greatest significance for the development of this district. That part of the vein which is to-day hidden by the extensive glacial sediments so as to render difficult the work of the miner, will later play a very important part.

I observed at Swastika a tectonic zone almost identical in character and striking in the same direction. In this region several insignificant gold discoveries were made as early as 1907, but systematic prospecting did not occur, however, until 1911. In July and August, of this year, large veins and very rich occurrences of free gold were discovered along the above-mentioned zone. Rich deposits were specially observable where the veins filled in a fissure between the Keewatin rocks on the one side and an arm of Laurentian granite on the other (Lucky-Cross claims). Prospectors surmise that this zone extends in a northeastern direction as far as Larder Lake. My own observations do not permit me to express an opinion in this matter.

4. Genesis.

Professor W. G. Miller is of the opinion that the gold-bearing magma is connected with great granite intrusions which forced their way upward after the lower Huronian period. Not far from Porcupine at the present time masses of such granite outcrop. The occurrence of feldspar, tourmaline, and inclusions of gas are in harmony with this view; moreover, in certain veins specimens have been found possesing the composition of granite and exhibiting free gold.

5. Economic Outlook.

The great forest fire which swept this country last July has set back the development of this gold district for at least several months by the destruction of many structures connected with the mining and winning of the ore values. As a result of this no considerable gold production is to be expected before the beginning of next year.

Keeping in mind all the conditions referred to, it is difficult to believe that more than a small minority of these mining ventures have any possibility whatever of success. In addition to many gold regions whose development is only in the initial stage there are already six to eight mines, which, judged by present appearance justify in some cases even the very highest hopes. These new gold fields will, therefore, in the course of a few years, play a part in the gold market and in time approach in importance the best American gold regions.

Those in attendance at the next International Geological Congress, which will be held in Toronto in 1913, will certainly have an opportunity to visit this region.

THE NO. 3 MINE, NEAR SUDBURY.

The Canadian Copper Company is developing, in the Sudbury district, another mine known as No. 3. By the existing roundabout wagon-road route, the property is distant about eight miles from the company's smeltery at Copper Cliff, but when the direct railway, in course of construction by the company, shall be completed, the hauling distance between mine and reduction works will be only about four miles.

A shaft is being sunk; it is down about 200 feet, and sinking is to be continued until a depth of 1,000 feet shall be reached. It is a four-compartment shaft, having three skip-ways and a man-way; it is nearly vertical—on an incline of about 77 degrees—and practically parallels the contact of the ore with the country rock. Mining ore will probably be commenced at about 700 feet depth.

The skips will each be of four to five tons capacity; they will be operated by electric power, current for which will be transmitted over a 3-phase line now being erected. Skips will be hoisted up a steel headframe, about 90 feet high, and the ore dumped over grizzlies, the coarse going to the crushers, there being a separate grizzly and crusher for each skip, thus making three units.

The material from the crushers will first be screened; then the coarse will be passed to a picking belt and the waste rock and some concentrating ore be picked out. The ore left on the belt will fall from this conveyor into bins served by railway cars, in which it will be hauled to the smeltery. It is planned to make the daily output of ore about 2,500 tons. Advance exploration of the mine will be by diamond drilling.

The rock-house is of steel construction. The powerhouse, distant from the shaft about 300 feet, is of brick and steel. A 20-drill compressor is being put in, and foundations for another have been built. A motor-generator set will provide direct current for underground electric haulage. The 3-drum hoist is of 250 h.p.

GOING SOME.

The following is a copy of the body of a letter received by a well-known Canadian mining company. As it appeared to have been written in all seriousness it serves to indicate the profound ignorance of the writer of the conditions under which copper occurs in ores. He wrote: "I presume by your name you are a copper mining company. I am taking an interest in a newly invented machine for cutting blocks of copper in the mine. It will cut up any size of a block in any position. Have you any work of this kind you would let on contract for us to do?"

THE DIAMOND VALE EXPLOSION.

Mr. James Ashworth, to whom we are indebted for the accompanying photograph, has been reported thus on the Diamond Vale disaster. After stating that the force exerted by the explosion in the No. 3 mine of the Diamond Vale Company was less than in any case he had known, Mr. Ashworth proceeds as follows:

"This fact, coupled with the further fact that the flame was of low intensity, shows that although there was undoubtedly an explosion of a mixture of firedamp and coal dust at the originating point of ignition, yet the extension of the flame was due to the inflammation of coal dust as distinguished from an explosion," says Mr. Ashworth. "Thus although the bodies of some of the men were severely burned, yet the flame was insufficient to ignite paper which was found near the bodies. At the point of origin a dinner can hanging on a prop was not unsoldered. The level along which the flame travelled was wet under foot and damp all around. This again is a proof that, as I have always contended, watering a roadway will not control the extension of an explosion.

"This explosion, however, ought to teach a very practical lesson to all officials in charge of coal mines, namely, to be particularly careful where mixed lights are used. In the present case there is not a doubt but that the explosion was consequent upon one or both of

two miners using their open lights in preference to the safety lamps with which they had been supplied. It may not be generally known that a small percentage of firedamp, giving say a half-inch cap, is not an explosive mixture when combined with air, but when it is intimately mixed with fine coal dust the combination becomes an explosive mixture where an open light is used. Thus a Davy lamp might be used in a current of air having a velocity of six feet per second, and containing only four and a half per cent. of firedamp for a considerable time, but on the addition of a normal quantity of fine coal dust it becomes an explosive mixture and the flame will pass the lamp in about ten seconds. In the Merritt case it is probable that the men tested their chute with the Wolf safety lamps and not finding that the gas would explode in their lamps hung them up at the bottom of the chutes, and proceeded to work with their open lights, thus originating the explosion.

"After an explosion of this character," continued Mr. Ashworth, "there is usually a large production of afterdamp, the most dangerous constituent of which is carbon monoxide, but in this case the men escaping from the other portions of the mine passed through the smoke and dust without any one of them being overcome, and this remark applies also to two of the men who were burned by the flame.

"Although the ventilation fan was thrown out of position and rendered useless for the time being, the natural ventilation was so strong that the explorations were continued without serious difficulty.

"It may be of practical interest to people in general to know that the two-hour rescue apparatus which was quickly brought from the Nicola Valley Coal Company's colliery with a gallant band of rescuers had to be abandoned as being too cumbersome, but a one-half hour apparatus, which is much lighter in weight, rendered a little aid. The rescue was, however, mainly conducted without the use of any rescue apparatus. The lack of this equipment did not add to the death roll.

"This disaster is one more instance of the danger of mixed lights in coal mines and the want of technical knowledge of miners of the increased danger caused by the addition of a small or ordinary percentage of coal dust to a percentage of firedamp in the air and which is not in itself an explosive mixture.

"The extension of this technical knowledge is being attempted by the Nicola Valley Colliery officials, who hold a weekly meeting to discuss matters relating to the safety of mines, and such very desirable meetings must of necessity lead up to the provision of technical mining classes, under Government direction and supervision, in all coal mining camps."

SOME FEATURES OF MINING IN MEXICO*

For several centuries, Mexico has been the greatest silver-producing country of the world. It is one of the richest mineralized areas known, and has rightly been called "The Treasure House of the World" by Baron Von Humboldt in his descriptions of his travels there.

The silver-bearing region follows, in general, the direction of the Sierra Madre Cordillera, from the State of Sonora in the north to Oaxaca in the south. Most of the mines occur in the great central platean to the east of the Sierra Madres and at an elevation of from five thousand to ten thousand feet.

The greatest silver producing states are Guanajuato, Zacatecas, Durango, Sonora, Chihuahua, Mexico, San Luis Potosi, Hidalgo, Jalisco, Siniloa, and Oaxaca.

The first mine worked by Europeans (Spaniards) was in the town of Taxco in the State of Guerrero. It is said that the ancient Toltecs or Aztecs worked mines in this neighbourhood long before the Spanish Conquest, and that they opened not only placer mines, but underground workings. This is hardly likely, as they had no iron implements, although they did have chisels and hammers of an alloy of copper and tin. Further, the treasure that was delivered to Cortez by Montezuma, the Aztec emperor, has been computed to have been worth over six million dollars.** Of this, five hundred marks, or less than two thousand dollars in value, was of silver, chiefly plate, drinking cups and so on—the greatest part of the treasure being gold. I think that this fact—that the silver was of such a

*Address delivered by C. W. Workman, Mining Engineer, Alfred Street, Kingston, before the students of the Kingston School of Mining.
**Prescott's History of Conquest of Mexico.

minor quantity as compared with the gold—is in itself sufficient evidence to show that they worked only placers.

During the three centuries of Spanish regime—from 1521, the year Mexico City (Tenochtitlan) surrendered to Cortez—until 1821—when Mexico won her independence from Spain—over three billion pesos (a billion and a half dollars) of gold and silver were extracted. It is remarkable that nearly one-third of this metal came from one single vein—the "Veta Madre" (mother vein) at the town of Guanajuato.

When Baron Von Humboldt visited the republic, in 1800, about three thousand mines were in operation. I mention this because he has described many of them in his writings about Mexico, and from his descriptions many of the so-called lost and "buried" mines have been reopened and identified.

Although the mining methods at this time were crude, we must acknowledge that the old Spanish miners were splendid prospectors. We realize this when we consider that there are very few silver or gold veins being exploited in the Republic to-day which were not known to the Spaniards and worked by them. In fact, the new veins can almost be counted on the fingers of the two hands, and these are often veins that have been capped at the surface by a volcanic flow (e.g., the great Dos Estrellas mine El Oro Estado de Mexico).

Of course, prospecting in Mexico was much more easily done than it is in our northern countries. As there has been no glaciation, the outcrops of the veins in most places stand out like great walls, the vein filling being generally harder than containing rocks which have been eroded on either side. In addition to this a large part of the mountainous region is arid and there is consequently but little vegetation. Prospecting in Mexico at the present day is quite different from prospecting here. You may be sitting on a bench at the plaza of a small town, listening to a band concert—for every village has its plaza (park) and band—or watching the crowds of natives pass by, the men with their brilliant serapes (blankets), and the women with their black rebosas, when you are approached by a native, hat in hand, "Senor, Senor!" "Well, what is the matter, friend?" "I have a little sample from a vein my father worked years ago, which is now hidden, and its location is known only to our family. If the Senor wishes I can show it to him"—I might say that you are more liable to be approached by one of the "promoters" if you are wearing what a friend of mine calls his "technical clothes." The appeal generally ends with a request for a little money in advance. If you accede to this request you will have seen the last of him probably, but, if you are wiser and promise him so much down, when once on the trail, it doubtless will result in a good hard ride the next day, and you will be shown some veins that more than likely are worthless. But, as you know, it takes a good many veins to make a prospect, and a good many prospects to make a mine.

I do not forget one trip I made of one hundred and fifty miles in the saddle—four days' hard riding—travelling early in the morning and late at night with a rest (in the heat of the day) from ten till two o'clock. At the end of the journey I found that I had been on a wild goose chase. I wish I had time to relate to you some of the incidents that occurred on the way. I may mention that on this trip we passed through a camp where they were using "arrastras" to grind their ore, the old "patio" process to reduce and amalgamate the silver, and old Spanish reverbatory furnaces to smelt it. There were sixteen "arrastras" run by water power, the water being brought through ditches and flumes from a neighbouring mountain stream. The ore was fed by hand into well-like depressions lined on the bottom and sides with flat flagstones, and over these were dragged huge chunks of rock, chained to wooden sweeps. These last were revolved by horizontal water wheels with inclined paddles. The "arrastras' were set in tiers of fours. The water from the first, or highest, after passing its vanes or paddles, fell upon those of the second, and so on.

Without further digression, I would like to say something about the geology of the silver deposits, with more particular attention to the district in which I was working.

The silver deposits of Mexico are represented by three classes. Firstly, fissure veins in eruptive rocks; e.g., Pachuca and Mines of Jalisco. Secondly, fault fissure veins in metamorphosed rocks; e.g., Guanajuato veins. Thirdly, secondary veins and replacement deposits in cretaceous limestones; e.g., lead silver veins in San Luis Potosi and Coahuila.

The mine where I was employed is in the Etzatlan district, in the State of Jalisco, some fifty miles west of its capital — Guadalajara — a city of a hundred thousand population.

The rocks in this district are andesites—often capped with rhyolitic and trachytic tuffs. The veins are true fissure veins, which is generally true of the silver veins in Mexico except the lead-silver deposits of the northern states, which, as I mentioned before, occur as replacement deposits in limestone.

At the San Juan and Sto. Domingo, in State of Jalisco, the country rock is an augite-andesite, and I believe it is tertiary age. The vein filling is quartz and calcite and is banded in structure. The silver occurs in dark bands of sulphide and antimonides. Argentite and stephanite are common, and native silver as well as the bromides and chlorides of silver is often found in the upper oxidized portion of the vein.

I might say that in this district, oxidized ore is still encounteredon the 900-foot level. This is a marked difference from the veins in our northern glaciated country, where we seldom find oxidized ore at a depth below sixty or a hundred feet, or in Ontario within a few feet of the surface.

One vein system in this district is apparently of at least two ages — a system running north and south, and a system running northwest and southeast. These last fault the first system, and the throw is nearly four hundred feet. Both systems are cut by several later faults. The throw of the main one of these is forty feet on the surface and about fifteen feet on the 900 level.

The ore values have been found in the first vein-system and in that portion of the second vein between the faulted ends of the first. Bonanza ore has been encountered almost without exception at the intersection of any vein with the north and south series. The veins are very porous and have a heavy selvage on the walls, which are nearly perpendicular in the oldest. (85 deg. dip).

The veins are full of water, but on account of their porosity drain very rapidly. On tapping a vein by a cross-cut from a winze, work had to be abandoned for a short time on account of the heavy in-rush of water.

On pumping this out it was found that the vein had been drained for several hundred feet on each side.

The veins are continuous and can be traced for a couple of miles. The ore shoot that is being worked is more than 1,500 feet long and varies from 40 feet to 3 feet in width, averaging about 15 feet. That is, it is a series of lenses.

The calcite filling seems to be secondary, or a filling that occurred during a reopening of the vein. Where it is found, it is in the centre of the vein and is full of great long "vugs" or geodes. The calcite carries but little gold or silver value.

It is peculiar, also, that the galena and zinc blende carry little silver values—although from the great masses of these that occur on the walls often run out small stringers of rich silver sulphide.

Oxides and carbonates of manganese (pyrolusite and rhodocrosite) are often found in this district in association with the silver ores.

I will not burden you with a description of the present mining and milling methods used, but would like to say a few words about the methods of the old-time workers—methods which are still employed in many mines in the Republic.

Mexico is a land of contrasts, and in the same way as we see old wooden ploughs working alongside of modern steel ones, or wooden wheeled rawhide-tired carts alongside of automobiles; so we see mines being worked by the old Spanish methods alongside of others fully equipped with the most modern mining and milling machinery.

The mines were formerly worked by either the "partida" or the "buscone" system. (Partir means to divide and buscar to search or look for). The partida system is a leasing or tribute method. The miner is allotted a working place and is given a certain share of the ore he extracts. In the "buscone" system the miners work for the company so many days in the week without pay, then they are given one day when they can mine where they please, within certain limits, and are given a share of what they bring out that day as their wages for the week's work.

Of course, all this tends to very unsystematic methods of working, or "gophering." No attention whatever is paid to the driving of permanent levels, but the ore is followed up or down or across as the value varies, and the workings become as intricate as galleries of an ant-heap. You will see from this that the ore was not brought out of the mine in cars or even in a wheel or hand-barrow, but it was carried out in baskets or in "tanates" (rawhide sacks).

These "tanates" are cut from single rawhides, and are bound together with rawhide straps. They are about three feet high and are ten inches or so in diameter at the bottom, and about a foot and a half in diameter at the top. They are carried on the back with a broad band from the forehead in the same way that our Indians carry their packs with a "tumpline."

A good "tanatero" will pack two hundred pounds up chicken-ladders and inclined passages to the surface. In a shift he can raise, say, three or four tons to a height of a hundred feet.

I have used the term "chicken ladder," and I suppose I ought to explain what is meant by it. A chicken-ladder is a log ten or fifteen feet long and 8 or 10 inches in diameter, with notches sawn or chopped in it and set up as a ladder. On first acquaintance it is rather difficult to navigate, as you must climb sideways and cross your feet at every step, but once accustomed to it you will find that it is much less fatiguing to climb than the ordinary mine ladder. For the carrying of loads it is much more convenient, especially for the Mexican, who, as he cannot afford to buy boots, wears sandals. The narrow rungs of the American ladder hurt his feet through these thin-soled sandals, while the broad notches of these ladders offer a good support for the whole foot and allows him the full use of his hands, with which to steady himself against the walls.

In the mine where I was employed, there were inclined roads from the surface to the 700-foot level. These were galleries cut at low angles and with stone steps. Sometimes they were in the vein and sometimes in its walls.

In addition to the ore that was carried up in tanates through these roads, there were also ore and water hoisted through shafts. There was a shaft from the surface to the 400-foot level. It was cut in the hanging wall and was "naked"—that is, it had no timbers and no guides. The hoisting was done by a mule whim. The drum of the whim was about 20 feet across and had four sweeps, the ends of which would describe a circle of about 50 feet in diameter. The hoisting rope, about an inch and a half in diameter, was of woven rawhide thongs and about 600 feet long. There must have been hundreds of hides used in making the rope and keeping it in repair. It passed over wooden sheave wheels (of lignum vitae), took two or three turns around the whim and either end was fastened to a rawhide bucket.

There was also a winze from the three hundred foot or tunnel level to the seven hundred foot, and here also had been a whim driven by burros. When I went to work there first, there was a boiler and hoist installed underground at this winze, and cable guides were stretched from the top to the bottom to keep the bucket in place. I had *one* ride in this winze. I had been surveying, and was tired, so thought I would enjoy a ride up. I climbed on the cross head with the shift boss, a Texas Mexican, and we started. Our lights soon went out, as the cables swayed a great deal. About half way up Jose began to yell and called upon all the saints in the calendar. I called across to ask what the matter was, and the reply I got was that he wanted to let them know that we were coming. This worried me a little, and I did hope the "them" did not refer to the saints. I found afterwards that the hoistman, although he only wore sandals and loincloth, couldn't stand the heat from the boiler and the hoist, so he had the habit of starting his hoist, running out into the tunnel, where it was cooler, and when the bucket should be about due, running back to the hoist again. After that I always walked.

The ore, after it was brought to the surface, was cobbed and sorted and then packed on mules or burros to the "Hacienda de beneficio," or mill.

A trip with one of these mule trains is interesting, it is also musical. You hear the jangling of the bell of the old bell-mare in the lead, the jingling of heavy spurs and saddle trappings, and the songs and shouts of the "arrieros" (muleteers) as they urge the animals along.

I remember an American lady who had no knowledge of Spanish, telling us how she was so impressed by the softness and rhythm of that language, even when coming from the throats of those rough mule-

teers. It seem she had been riding and had overtaken a mule-train which she could not pass on the narrow road, so she trailed in behind them. She said they did not call their animals "mulas" or "burros," but "such and such," and "so and so." Well, what they called them may have sounded musical, and it surely must have had persuasive powers with the mules, for I am certain that no self-respecting mule would stand and listen to it. It would not bear translation into English.

But, coming back again to the treatment of the ore, when it reached the mill it was ground in arrastras as I have already described, then shovelled out and concentrated on "planillas." These "planillas" are floors paved with flagstones. They are about eight or ten feet long by about five or six feet wide, and are slightly elevated at one end. They are also divided one from the other by flagstones set on edge. In front of the lower end runs a stone gutter full of running water. The operator sits in front of this gutter, and, dipping a cow's horn or a half gourd in the gutter, he keeps throwing water on the pile of ground ore at the upper end of the planilla, and thus washes out the sands and slimes, leaving the heavier sulphides on the planilla as concentrates. These were smelted in Spanish reverbatory furnaces.

The tailings from the planillas were carried or scraped into "patios." A "patio" is a large court or yard, also paved with flagstones, and on this the ground ore was piled up until about two feet or so deep. This spread out ore is called a "torta," which means a cake. Salt is then added (about 5 per cent. by weight), and trampled and mixed with it well by driving teams of horses through it. The horses are fastened in teams of six or eight with a driver on the back of one of them.

In a day or two blue vitriol is added, and this also is mixed by horses and men. In a few days more, quicksilver is added, and the mixing process continued until amalgamation is complete.

The silver sulphides by the action of the salt and copper sulphates are changed to silver chlorides. The silver chlorides are reacted upon by the mercury and form mercury chlorides and free silver. The mercury chlorides are, in turn, broken down by the copper salts and copper chlorides are formed with free mercury, which amalgamates with the silver.

When the process is completed, which often requires three weeks or more, the whole "torta" is cleared off; and the amalgam, which has sunk to the bottom, is swept up from the riffles between the paving stone, collected into stone tanks, and washed. The mercury is squeezed out, distilled off from the amalgam to be re-used, and the resultant metal is smelted with borax and moulded into silver bars, to be shipped to the mints or refineries.

These processes are now, of course, only interesting historically, as they are rapidly falling into disuse and are being replaced with the modern grinding, agitating, and cyaniding processes.

SOME OLD METHODS IN MEXICAN MINING AND METALLURGY

By Stanley N. Graham.*

Fig. 2.

*Mining Engineer, Toronto.

The present disturbed conditions in Mexico are attracting a great deal of attention to that country, and, while the political revolution is somewhat doubtful the revolution in mining and metallurgical practice is an accomplished fact. As many of the old methods are now very seldom seen, perhaps the following notes and photographs may be of interest to readers of the Journal.

Photographs Nos. 1 and 2 show "tanateros" packing ore out of a mine. The first is a view on surface as tanateros come out of a prospect shaft, and the second is a flashlight underground.

The ore is carried in rawhide sacks by men and boys travelling up winding inclined roadways and, where necessary, using the "chicken ladder" or notched log. The load varies from 100 to 200 pounds. This work is generally paid per ton (metric ton of 2·204 pounds), or per foot advance of heading. The cost runs about 40 cents per ton per 100 feet vertical.

While much of the ore extracted was carried out of the mine in this manner a great deal was hoisted through vertical shafts by the "malacate" or horse whim. It seems, though, that the primary object of the vertical shafts found in the old mines was that of unwatering the mine. The malacate consists of a drum 10 to 12 feet in diameter, and 6 to 8 feet high with the axis vertical. To this long sweeps were attached and horses or mules used as the motive power. Two raw-hide cables were generally used, working in balance, and to these a raw-hide was hung for a bucket.

Fig. 1.

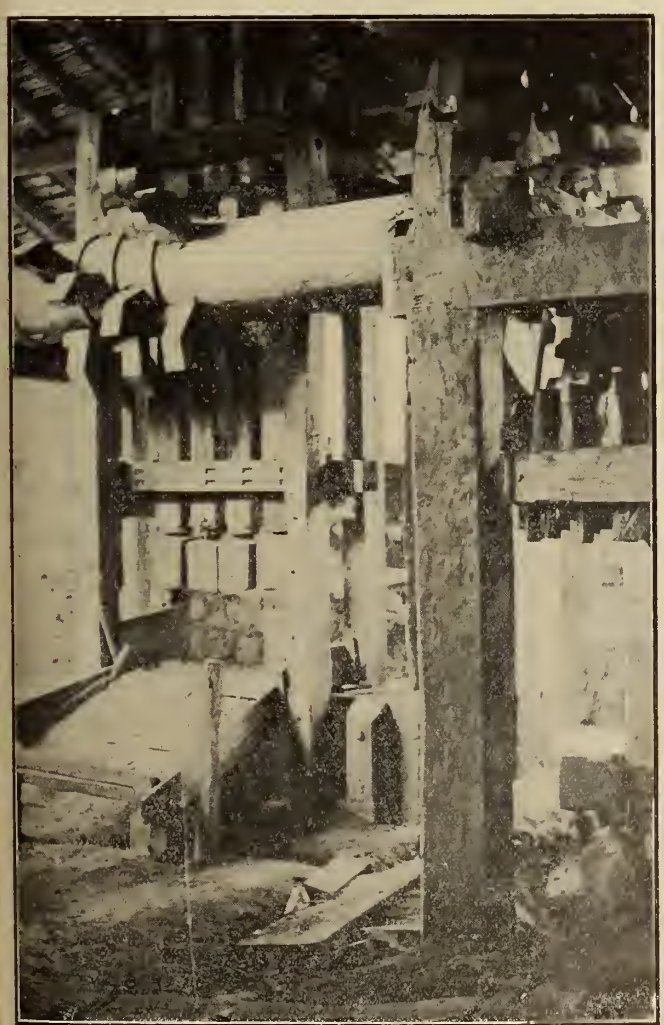


Fig. 3.

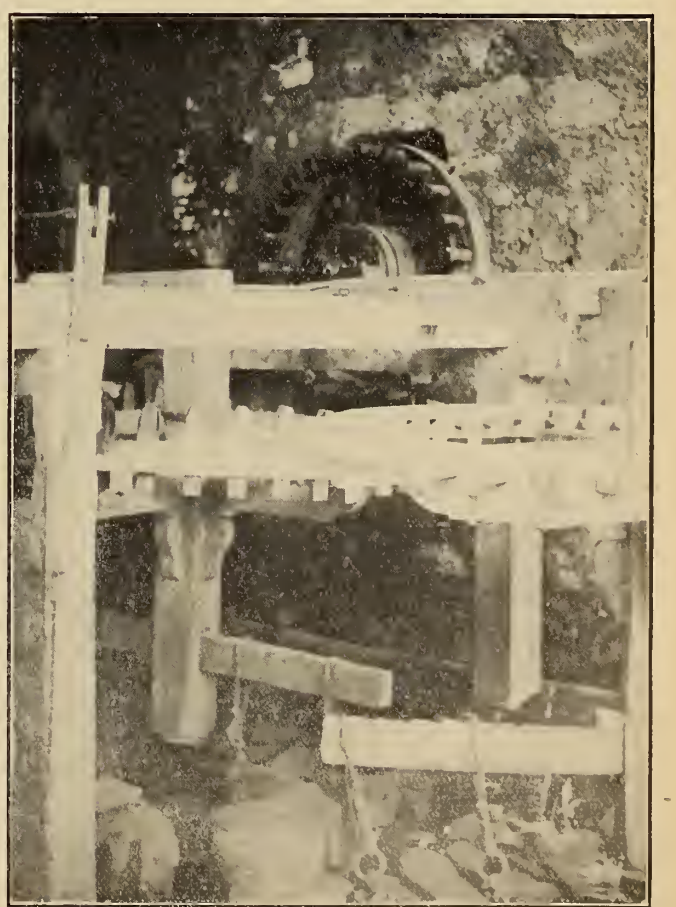


Fig. 4.

In unwatering this skin was landed on a masonry sluiceway, and, collapsing, acted as a self-dumping bucket.

The ore won is carefully hand sorted. The Mexican "peon" is a very expert ore-sorter and the costs for this work are not high. The ore is thus brought up to a value that will enable it to stand the high treatment charges of the crude crushing appliances and of the patio process.

The ore after hand sorting is delivered to the crushers—chilean mills or wooden stamps—in sizes averaging about a 2-inch cube. The chilean mill consisted of a stone centre, 5 to 6 feet diameter, and 10 to 12 inch face with a heavy iron tire. The long axle is extended outwards to form a sweep to which a mule is hitched. Inwards the axle is attached to a vertical post free to revolve as the mule draws the wheel around. The wheel runs on hard rock or iron track, from the edges of which rise inclined iron gratings. A man follows the wheel shovelling the crushed ore against the grating and pulling the oversize back on the tread. Crushing is done to ½ to ¾ inch.

Wooden stamps are occasionally lifted by men, but are generally run by water wheels. The photo, No. 3, shows a 4-stamp battery which is run by an overshot water wheel, the axle of the wheel being extended to form the cam-shaft. This cam-shaft holds four sets of wooden cams. The stamps are worked with a high drop and order of drop is 1, 2, 3, 4. The stems are made of oak, 6 x 6 inches and 12 feet long. In general usage they are shod with ½-inch strap iron. Crushing is done to about ½ inch and for screens perforated hides, perforated sheet iron or gratings of round iron bars are used.

Ore from the chilean mills or stamps is ground in "arrastras." The illustration shows two of a set of four arrastras driven from one water wheel. The grinding stones are about 18 inches square and the charge is about one ton per day.

From the arrastras the sands are transferred to the "patio," a yard paved with flat stones. It is made up in charges of 30 to 60 tons and spread in "tortas," or cakes, about one foot thick. Five per cent. salt and one per cent. copper sulphate ("magestral") is added. The charge is turned over and stirred by mules walking through it (photo No. 5). Mercury is added in amounts necessary and tests are made by taking samples and panning. The time required for a charge varies from four to five weeks, after which the amalgam is collected by washing and settling. On argentite ores the extraction of silver is 85 to 90 per cent., but only 30 to 40 per cent. of the gold is recovered.

To the decreased relative value of silver to gold, the increased cost of labour and of corn (for mule power) is due the decline of the patio process.

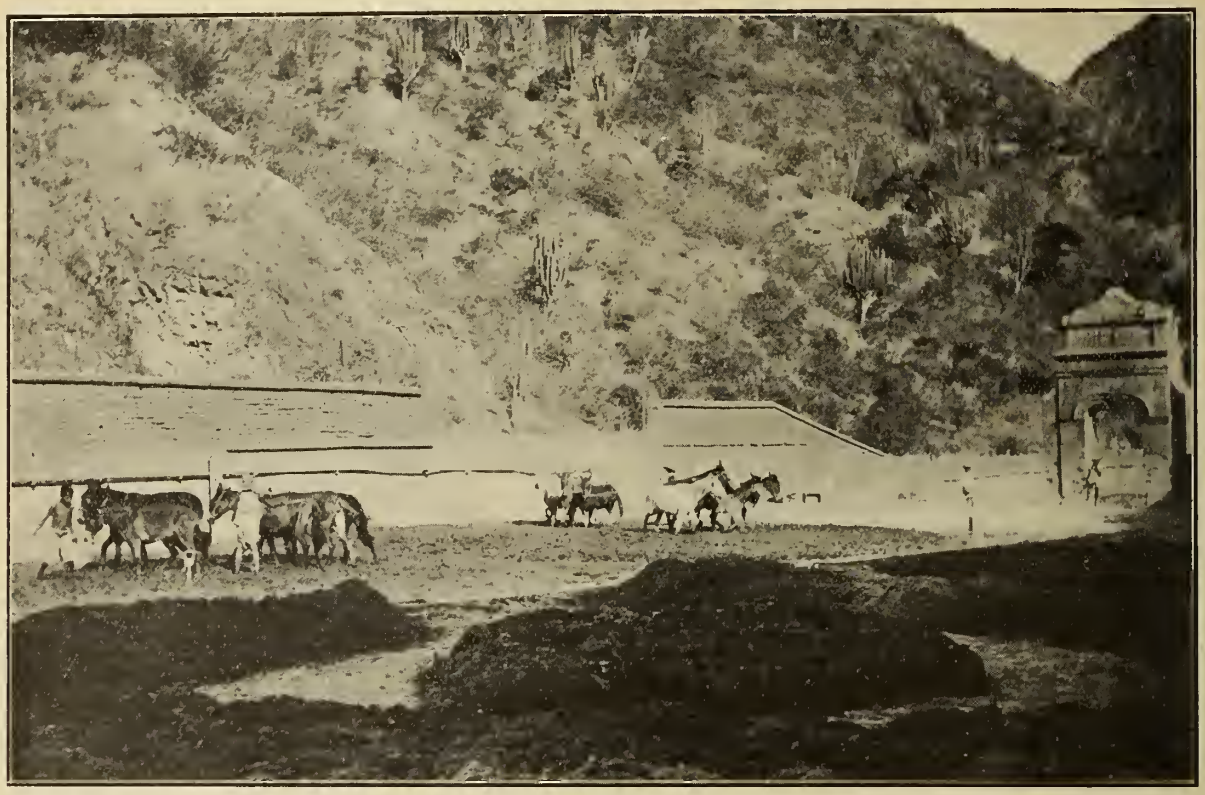


Fig. 5.

THE DOMES OF NOVA SCOTIA

By T. A. Rickard.

(Continued from last issue.)

PART II.

Introduction.

In 1905 I was engaged by the Government of Nova Scotia to examine and report upon the goldfields of that Province with a view to giving advice concerning the best method of stimulating a declining industry. After I had completed my investigation of the gold-bearing lodes of the country I turned, as was proper, to the descriptions and explanations published by ear-

A paper to be discussed at a meeting of the Institution of Mining and Metallurgy, to be held in the Rooms of the Geological Society, Burlington House, Picadilly, W. on Thursday, April 18th, 1912, at 8 O'Clock p.m. and presented at a meeting of the Canadian Mining Institute, at Toronto, on March 6th, 1912.

lier investigators, and in ransacking the literature of the subject* I found delightful evidence of the growth of geological thought from 1860 to the present day. This evidence can be summarized in the form of a series of quotations, accompanied by my own comment, and it is here proffered as a contribution to the study of economic geology.

Before citing a succession of observers, I shall ask you to remember that the longer axes of the saddles and domes, on which the ore is found, have a strike from east to west, that is, parallel to the backbone of the peninsula of Nova Scotia, with cross-folds extending roughly from north to south. Next it is necessary to explain some of the terms used by earlier writers and sanctioned by local usage: "Lead" is used as a synonym for "lode." The slate is variously called "shale," "clay slate," argillite," and "belt." The last of these is also a synonym for "bed." The quartz is said to lie in the "belts" of slate. The quartzite is called "sandstone," which is not far wrong, although the rock in question is undoubtedly crystallized by metamorphism. Another local synonym for quartzite is "whin." This, of course, is an old British term applied to the trap-rock forming the base of that horizon in the Carboniferous in which are found the lead deposits of the north of England, notably at Alston Moor. Used thus it is the equivalent of the Cornish "elvan." As applied to the Nova Scotian quartzite it is entirely wrong, and serves merely to perpetuate an early error. Both "belt" and "whin" are localisms of a pernicious character, because any special significance that they may possess is misleading.

Gold was discovered at Waverley† in August, 1861. Earlier discoveries had been made at Tangier, in 1860, but they proved unimportant.

* * * * *

Benjamin Silliman, Jr.

In the following year a famous American geologist, Benjamin Silliman, Jr., offered a description of the Nova Scotian goldfield in a paper published at Newhaven, in February, 1864. He made reference to the strong marks of glaciation and the proofs of extreme denudation. Mention is made of "the universal evidence of a high degree of glacial action, which has so worn down and polished the rocks that their edges everywhere resemble the leaves of a book which has been cut with a dull knife in the binder's press; in a direction at right angles to that of the leaves."

* * * * *

He gives a section and a perspective view of the Waverley deposit, and says:

"Only the corrugations in the open part of the cut are visible; the extension of the vein to the right and left is ideal, the superincumbent mass covering it. I measured, however, the quartzite above, dipping to the right and left at a small angle, and I think no geologist would doubt that the crest of an anticlinal axis here comes to the surface and has escaped the denudation which has removed the top of the crest in most places. The corrugations, or folds, appear to be accounted for on the supposition of a lateral thrust producing the undulations. The annexed perspective view of this interesting locality is taken from a stereoscopic photograph, showing the appearance of the barrel quartz after the surface rock (quartzite) has been removed, and before the miners have broken up the quartz layer for removal."

It is obvious that Silliman made an acute diagnosis of the structure and we shall see that many years passed before any later scientist was able to throw fresh light on the subject.

T. Sterry Hunt.

Four years later, in 1868, a celebrated chemist and geologist, T. Sterry Hunt, made a report for the Geological Survey of Canada. He quotes Campbell as having drawn attention to "the grain or reed-like marking often impressed on the surface of the beds in a direction parallel to the east and west axes of folding, and he points out that the angle of dip, eastward or westward, of these markings on the crown of the great anticlinals enables us to detect the transverse, or north and south, lines of undulation, which have at a subsequent period disturbed the horizontality of the east and west anticlinal folds." It is obvious that for the "angle of dip" we should read "pitch."

Hunt himself proceeds to say:

"The markings in question often appear as rib-like ridges or flutings, which are most conspicuous on the surface of the auriferous quartz layers and the enclosing beds. On the summits of the anticlinal folds they are sometimes so large and so well defined as to give the layers a wrinkled or corrugated form, producing what is designated in the region as 'barrel' quartz, and has by some observers been compared to the ripples on water, and by others, to that parallel arrangement of logs which is seen on what is called a corduroy road."

In explaining the origin of the deposits of gold-bearing quartz, Sterry Hunt says:

"So far as my present observation goes, I think that to describe them otherwise than as interstratified beds would be to give a false notion of their geognostic relations. The laminated structure of many of the lodes, and the intercalation between their layers of thin continuous films or layers of argillite, can hardly be explained in any other way than by supposing these lodes to have been formed by successive deposition at what was, at the time, the surface of the earth. There is, moreover, evidence that these laminae were formed before the lodes were folded and contorted; this is furnishd by some remarkable specimens of the so-called barrel quartz which I took from a lode at Upper Stewiacke. . . . It seems not improbable that the corrugated structure of the lodes, which gives rise to the barrel quartz, is due to the difference in texture, and to the greater resistance to lateral pressure offered by the quartz layers than by the enclosing beds of clay and sandstone, which by their consolidation have given rise to the argillites and quartzites."

Thus he supposes the quartz to be an original member of the sedimentary deposit in which it now lies embedded and he imputes the crenulation to subsequent folding. The corrugation of quartz and the corresponding fluting of the rock encasing them are essentially different from ripple-marks, such as, for example, I saw on the foot-wall of the Johnson's Reef mine at Bendigo.‡ The efficacy of lateral pressure alone is negatived by the fact that the "barreling" or crenulation is exhibited by veins that cross the stratification.

Henry Y. Hind.

The next observer to write on the subject was Henry Youle Hind, who published a report in 1869. He had an active imagination, for he says: "A very feeble

*In which I was greatly aided by a bibliography placed at my service by Mr. J. Edmund Woodman, then professor of geology in Dalhousie University.
†Originally it was Waverly, probably from an error in spelling.
‡Trans. A.I.M.E., Vol XX., Page 219.

conception can now be formed by superficial observation of the original enormous magnitude of these huge waves of rock which ridged the surface of the Province. Whether denudation took place as fast as the uplift, or whether the undulations attained their maximum altitude, partially or wholly undenuded, it is certain that not less than 9,000 feet, in vertical thickness, belonging to one rock series, have been removed from the present surface of the Waverley gold district."

* * * * *

Hind's idea of simplicity is to ignore facts. However, in his description of the details of lode-structure he exhibits powers of observation better disciplined. He says:

"At Waverley, movement has occurred between the quartz and the whin, or between the quartz and hard slate, or in the bands of slate, and in all cases slickensides, reed-like markings, ripples, and small undulations have been produced. In the barrel quartz no sliding motion is distinguishable, for the corrugations extend far into the overlying whin rock until they assume the form of a series of connected arches 5, 6, and even 7 feet in width. The corrugations are by no means confined to the quartz lead, but spread out, fan-like, into the overlying rock."

He distinguishes between "true" veins, namely, the feeders that cross the stratification, and the "bedded" veins of the domes, thus. "While the gold which the bedded leads contain, in common with other metals, was most probably derived from the oceanic waters from which the quartz was deposited, the gold in the short segregated veins of subsequent origin was transferred from the bedded leads or auriferous interstratified slates." He makes note of the fact that at Montague, Sherbrooke and Laurencetown, the rich quartz or 'gold streak' dips (he means 'pitches') at the same angle as the corrugations. He attributes the occurrence of these richer portions to precipitation by organic matter, saying: "It would be a simple matter to explain the structure of the gold streak on the supposition that organic matter determined the deposition of the metal in belts or zones, for it is easy to conceive accumulations of stranded organisms on subaqueous beaches in a shallow sea in the form of long bands."

This coincidence between the pitch of the rich ore and a large corrugation or "roll" is an important fact, as has been proved by many small but successful mining operations in Nova Scotia. The "stranded organisms" are not confirmed by the evidence of vegetable remains, but it is true that slate is more plentiful at the anticlinal crests.

* * * * *

In describing the mines at Sherbrooke he distinguishes between lodes that are "intercalated, and consequently of later age than the contemporaneous beds." The last two words refer to the interbedded seams of quartz, which he thus distinguishes from the quartz that appeared to him to be unstratified. He goes on to say:

"In broad bands of slate, lodes thicken to the breadth of 10 to 12 inches and thin out to a film of quartz or disappear altogether in the space of a few hundred feet. But before they thin out altogether, another lode begins to appear, separated from the first by a few inches, more or less, of slate and quartzite. This cannot be strictly regarded as a continuation of the lode which has thinned out—although it may thin out and be in part overlapped by another lode in the strike of the first one which has disappeared. Some lodes of this description appear to belong to the class of intercalated lodes, that is, they are sheets of quartz that have been formed at a later date than the enclosing rock, and were produced by the replacement, particle by particle, of pre-existing beds of some other soluble material. In lodes of this class, which generally occur in slate, the slate itself is found to be auriferous, and the whole mass is frequently worth crushing. The strong persistent lodes generally occur in quartzites, or with quartzites on one side and slate on the other. The intercalated lodes occur in slate, with sometimes thin beds of quartzite, which are also intermittent, that is, 'thin out' and 'take up' again.

Here he recognizes that the quartz assumes the shape of flat discs or lenses, following each other *en echelon,* and he is on the track of the truth in imputing their form to the replacement of soluble sedimentary material. It is strange that he did not take the next mental step, and inquire whether the regular layer-like forms of quartz were not also a replica—in part at least—of rock replaced by silica.

* * * * *

In his description of Waverley, he is off the dangerous domain of theory, and does himself more credit. He says: "The so-called barrel quartz at Waverley is a fair representation of a corrugated lode, occurring on the crown of an anticline. In nearly all the gold districts the same form of quartz beds may be seen, and in similar relative positions. The corrugated structure is not confined to the quartz, but spreads fan-like into the overlying rocks, and appears to be, in part, the result of unequal pressure during the folding of the strata."

Warington W. Smyth.

At the meeting of the Society of Arts, in London, before which this paper was read, the chairman was Sir Warington W. Smyth. He was the only person present who cared to criticize Hind's theory, and he did it, as we should expect, in an effective manner. Smyth asked:

"If the gold has been deposited contemporaneously with the quartz by the sea-water, why was not all the gold deposited at the bottom of the sediment, by reason of its greater sepcific gravity? But by another part of the paper it appeared that the gold ran only in streaks, and that it seemed to be accumulated near certain crossings of these beds by other lines of quartz, which loked more like true veins. At present, therefore, he could not help saying he thought there was a good deal more to be made out. He had on former occasions visited certain localities, though not in Nova Scotia, where it was said that minerals occurred throughout a stratified mass, but he had usually found such a statement to be the result of a deficient observation. In a certain part of the stratified-looking mass there had been a dissemination of mineral matter, but very frequently this apparently stratified mass was nothing else but a mass of stratified material, ground and rubbed together, and existing between two walls resembling those of a regular vein; or, again, the mineral matter had been most decidedly intercalated at a period long subsequent to the original formation of the beds. He could not help thinking that this would prove to be the real explanation of the occurrence of the gold in a great part of these Nova Scotia deposits."

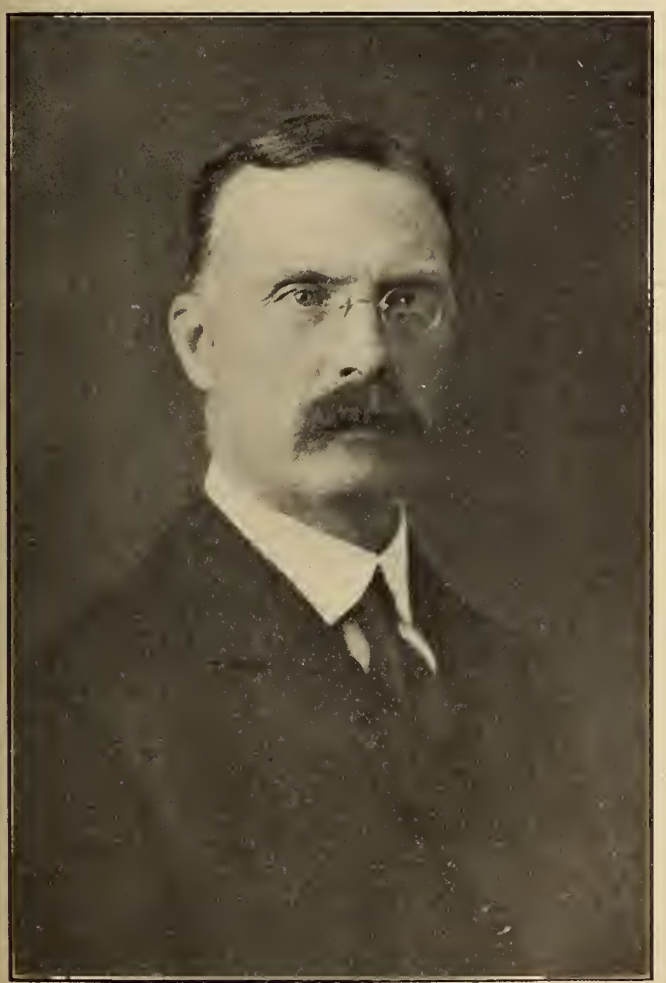
Thus Smyth placed his wide general experience against Hind's local knowledge. The reference to "streaks" requires explanation, that being the word used in Nova Scotia for the richer portions of the quartz, that is, ore-shoots. It is a misleading term, for the "streak" is not a line or thread of rich ore but a band that may be many feet wide, pitching at a strong angle, as determined by the "rolls," to which reference had been made, and by feeders or cross-veins that do not conform to the bedding of the country-rock and therefore penetrate the walls of the normal anticlinal sheets of quartz. Undoubtedly Smyth was right in placing his finger on this significant fact, a fact that suggested so obviously that the deposition of the gold could not be due to sedimentation.

(To be Continued.)

THE ONTARIO-MANITOBA BOUNDARY

Mr. J. B. Tyrrell, whose name is familiar to all of our readers, at the request of the Ontario Government, has accepted a position as leader of the expedition that is to choose and survey the five-mile strip of land running from the eastern boundary of the new part of Manitoba to the mouth of the Nelson River on the west shore of Hudson Bay.

No Canadian is better fitted to explore such country as that lying between Manitoba and Port Nelson. Not only has Mr. Tyrrell lead several expeditions in northern Canada, but he has also made a profound study of all extant literature bearing on Hudson Bay and the whole Canadian north. As editor of the "Journal of Samuel Hearne's Journey, 1769-72," published by the Champlain Society, Mr. Tyrrell is responsible for one of the most important contributions to the literature of Canadian exploration. Part of Hearne's route, between Fort Churchill and the mouth of the Coppermine River, Mr. Tyrrell travelled himself. Many of Hearne's observations on topography, ethnology, etc., Mr. Tyrrell was able to check. Hence his editing was of a peculiarly valuable quality.



Mr. J. B. Tyrrell

It may be added that the Province of Ontario is entitled to a strip of land five miles wide, extending from the eastern boundary of the new part of the Province of Manitoba, as established by an Act passed by the Dominion Parliament last session, to some point on the Nelson River, which the Province of Ontario may choose. The whole of this strip from end to end throughout its length of about 150 miles must be not farther than 50 miles from the shore of Hudson Bay. In addition to the strip five miles wide, Ontario is to receive a further area extending up or down the Nelson River for a distance of five miles and half a mile back from the river, giving the Province a continuous frontage on the river of ten miles.

The Nelson River, including its tributaries, the Saskatchewan and Red Rivers, is one of the largest streams on the continent, and it is not impossible that with the growth of the northwest territories and the extension of navigation to Hudson Bay one of the large cities of the world may grow up at is mouth. The importance of careful location of Ontario's share of the country near the mouth of the river may thus be appreciated.

Mr. Tyrrell plans to return south through the new district of Patricia. It is hoped that from this journey much matter bearing upon the mineral resources of the district will be obtained.

PERSONAL AND PERSONAL.

Mr. D. L. H. Forbes, mining engineer, Manning Chambers, Toronto, has been appointed consulting engineer for the Trethewey Silver-Cobalt Mining Company, Limited.

Mr. J. C. Murray, editor of the Canadian Mining Journal, has returned to Toronto after an absence of five weeks.

Mr. D. A. Brebner, managing director of the Manufacturers Corundum Company, sailed for England on April 23rd.

Mr. C. H. Macnutt, general manager of the Poderosa Mining Company, Limited, Antofagasta, Chile, is due in London, England, late in May.

Mr. Clifford Smith, mining engineer, Brockville, Ont., and Miss Beatrice Elaine Rimer, daughter of Mayor Rimer, of Bryson, P.Q., were married at Hull on April 24th. Mr. Smith has many friends in Toronto, where he often makes his headquarters, and in Co-

balt, where for some years he was engaged in professional work. This is but one case of a serious epidemic that broke out early in the year. Other cases are pending.

Mr. J. B. Tyrrell, mining engineer, Room 534, Confederation Life Building, has made arrangements to have his professional business attended to during his absence.

Mr. T. A. Wood, of Buffalo, who is associated with Mr. John O. Adsit, of Hornell, N.Y., in the South Bay Mining Company, of Gowganda, was in Toronto on April 18th. Mr. Wood had with him some very rich specimens of silver ore from the mine.

Mr. Elias Rogers, of Toronto, president of the Crow's Nest Pass Coal Company, has gone to England on a business trip.

Mr. G. O. Buchanan, Dominion Supervisor of Lead Bounty, has returned to Kaslo, B.C., after an absence of several months.

Dr. Cairnes, of the Geological Survey of Canada, was to leave Ottawa late in April for Yukon Territory, where he will be engaged in geological investigations during the ensuing field-work season.

Mr. P. W. Lover, late superintendent of the New Dominion Copper Company's Rawhide mine, near Phoenix, British Columbia, died recently in that province.

Mr. E. Jacobs visited the Canadian Copper Company's big smelting works at Copper Cliff before returning to Victoria, B.C. He left Sudbury for the West on April 15th.

The Western Branch of the Canadian Mining Institute purposes holding one of its periodical meetings at Ainsworth and Kaslo, B.C., some time during the latter half of May.

The first volume of "An Investigation of the Coals of Canada, with Reference to their Economic Qualities," as conducted at McGill University, Montreal, under the authority of the Dominion Government, has been issued by the Mines Branch of the Dominion Department of Mines. The report, which will be in six volumes, is by J. B. Porter, E.M., D.Sc., and R. J. Durley, M.E., assisted by Theophile C. Denis, B.Sc., Edgar Stansfield, M.Sc., and a staff of special assistants.

Col. Carson has returned from a trip to Europe He stated in regard to Crown Reserve affairs that large contracts had been made for ore on the Continent, while they succeeded in selling all the mine's bullion for a year ahead in London.

Mr. R. G. Drinnan, mining engineer, Vancouver, B.C, visited Toronto last week and returned to the Coast on April 25th.

Mr. Arthur H. Sancton has been appointed Canadian manager for Fraser & Chalmers, Limited. Mr. Sancton was formerly mining engineer for the same firm.

THE CANADIAN OIL SHALES AND THEIR COMPARISON WITH SOME ELSEWHERE

By Arthur Lakes. *

The existence of enormous and inexhaustible bodies of bituminous and oil shale as reported by the government survey is likely to be a source of considerable wealth to the country where petroleum oil is not otherwise a marked feature of production. It would seem at present that the natural oil resources of Canada are confined to a few wells and limited oil areas of New Brunswick and Ontario, whilst there would appear favourable signs of a possible oil field in Alberta. It was the absence of oil in Scotland and at that time in Europe generally, that led the thrifty Scots whose attention had been drawn by certain geologists to the oil bearing properties of areas of bituminous shales to the establishment of their oil shale industry and digesting works which for a long time were so successful until the discoveries of oil at Baku, Russia, and the oil fields of America affected the market. Extensive oil shale works have long been carried on successfully in New Zealand, where, as in Scotland, there appear to be no natural flowing oil fields such as we have in the United States, and petroleum has to be imported. It was not oil only that was digested and extracted from these shales, but an immense number of equally valuable bi-products including ammonia, naphtha, paraffin wax candles, etc. Analyses by the survey show the Canadian shales to be capable of between 30 and 40 gals. of crude oil per ton, with from 40 to 65 pounds of sulphate of ammonia. The New Brunswick shales vary in colour from gray to brownish and black and some are thin and known as "paper shales," and contain fish remains; others are in massive bodies of black or brownish tough elastic shale, rich in ammonia-gas and crude oil. The beds underlie the lower carboniferous formation, and are often of great thickness and extent. Some beds are 1,000 feet thick. "In these," says the Survey, Canada possesses a source of mineral wealth, the great value of which if properly developed can be scarcely overestimated."

In the Quebec region in the Gaspe Basin the oil shales are of a distinctive character from those in New Brunswick and Nova Scotia. They belong to the upper Devonian area, the nature of greyish sandstones, shaly in places, fossil plants are abundant in the formation.

Colorado Bituminous Shale.

The description of these bituminous shales and their prospective importance and value calls to mind the fact that in certain parts of Colorado similar shales abound in enormous quantities, and over very wide areas offering an inexhaustible supply of the material to which so far no attention whatever has been paid, so far as we know even an analysis. The area where these shales out-crop most conspicuously is in the Great Book-Cliff Plateau of North Western Colorado. This remarkable plateau, upwards of 2,000 feet high, extends for several hundred of miles east and west from the Grand River in Colorado into Utah and from south to north a hundred miles and more into the southern border of Wyoming.

It is composed principally of shales and sandstones of the Tertiary period including the Wansatch and Green River Tertiary groups, which rest at the base in Laramic cretaceous coal formations.

The plateau abounds in hydrocarbons such as oil

*Superintendent the Ymir-Wilcox Development Co., Ltd., Ymir, B.C.

springs, oil-seepages, fissures filled with asphaltum and porous rocks more or less saturated with oil.

The shales occur in thick bands. They vary from light coloured thin so-called "paper-shales" to darker and more massive bodies of blackish or chocolate coloured shales, some of a leathery elastic character. The shales are exposed on the sides of the steep cliffs of the plateau 2,000 feet in height and appear also up some of the canyons intersecting it. The shales are easily ignited by a match, their inflammable character was discovered at an early date by hunters, who were surprised to find their wood fire of the night before still burning in the morning, due to the rocks being on fire. It was the habit of the campers after this discovery, to bank their fires at night with these shales which insured a good blaze in the morning.

We have seen near Rifle Creek conglomerate underlying these shales dripping with black asphaltum or hydrocarbonaceous matter no doubt derived in some way from the shales above.

Nothing, as stated, has ever been done to test or develop or manufacture these shales into hydrocarbon producers; few probably know of their existence. They are quite accessible from points along the Rio Grande and Moffat railways.

The origin of the shales and plateau in which they are found is clearly fresh water as shown by fossil shells, insects, water plants, fishes, and mammalian remains.

The plateau represents the deposits of a vast series of fresh water seas or inland lakes accumulating fine deposits throughout the aeons. The bituminous shales would appear to be either the source of the hydrocarbons found at various points in the plateau or to be the recipients of hydracarbons from surrounding sources. There are no igneous rocks in the plateau and apart from its being gently folded into a synclinal or saddle shape, the strata are undisturbed and show no evidence of faulting hydrocarbons such as asphaltum, oil, etc., ascending through natural joint fissures in the strata.

INDUSTRIAL NOTES.

SULLIVAN MACHINERY COMPANY.

The March number of "Mine and Quarry," a quarterly bulletin published by the advertising department of the Sullivan Machinery Company, has just been received. While issued as an advertisement to show the application of Sullivan machinery to different classes of work, it contains much information of general interest to miners and quarrymen.

The recent issue contains a description of an exhaustive test of a Sullivan compressor; of the plant of a Lake Superior mine; as well as notes on the use of channelling machines, air lifts and stoping drills in tunnel work.

THE RENOLD SILENT CHAIN.

An attractive little catalogue has been issued describing the Renold Silent Chains. In the descriptive matter given, perhaps not the least interesting is that showing the growth of the firm. It was founded in 1879, employing one man, and has increased till the employees now exceed 1,000.

The advantages claimed for this drive are silence, smooth-running, efficiency and reduction of vibration. The range of applicability is from the drive of a motor truck to that of a motor driven mine hoist.

THE GOLDSCHMIDT THERMIT COMPANY.

"Reactions" is the name of a quarterly published by the above company, and devoted to the science of aluminothermics.

In the March issue are given descriptions of repairs to machinery and rail-welding by the Thermit process. The range of applicability is very wide and its use is extended to many different parts of the world.

SPECIAL CORRESPONDENCE

ONTARIO.

Porcupine and Swastika.

There are to-day in the Porcupine camp 50 stamps treating on an average 300 tons of ore per day. These two mills are the Dome, forty stamps, and the McIntyre, ten stamps. The next addition to the capacity of the camp will be the Vipond mill, with a maximum of 125 tons per day. It should be ready early in May, as excellent progress is now being made with construction. It is possible that the Hollinger mill may be in operation by the middle of May, but it is more likely to be the first of June in spite of the very satisfactory progress that is being made. At the McIntyre ground has just been broken for a new forty-stamp mill. It is probable that at first only twenty more stamps will be set up, but room in the building will be left for a duplication of the plant at any time. The five stamps at the Little Pet should be dropping by the end of this month. As soon as returns from the test mill run at the Kingston School of Mines have been received, plans will be drawn up and work commenced on a ten-stamp mill at the Dome Lake property, where marked progress has been made since the first of January.

To date, the production from the camp in 1912 consists of four gold bars from the McIntyre ten-stamp mill.

So excellent has been the saving on the plates at the McIntyre and the Dome that it is probable that Porcupine plants yet to be constructed will be designed with a much simpler flow sheet than those adopted at the Dome and the Hollinger. It is reported that the Dome tailings before cyanidation run very low, and at the McIntyre after amalgamation and concentration there is only a loss of between 50 and 60 cents.

Work has been resumed at Waiwaiten Falls, where A. E. Wallberg & Co. commenced to erect a power plant last November. Early this year money could not be provided for the conclusion of the work, and progress has been checked for at least three months. Now work has been resumed. It is understood at date of writing that the scheme has been re-financed by Mr. D. Lorne McGibbon, president of the La Rose and owner of many other water powers, but it has not yet been confirmed. There is no doubt, however, that the work will now proceed. The Porcupine power plant at Sandy Falls is already loaded to capacity, and further power must be provided for the camp as it develops. The Waiwaiten Falls project should be completed by the end of the summer.

Within the past month excellent progress has been made with the underground development of the Vipond. The shaft is down to 320 feet and a station is being cut at the 300 foot level and preparations made for cross-cutting for the veins at once. At the 100 and 200 foot levels the main or Godfrey vein

is opening up very nicely. At the 100 foot there is now a continuous ore shoot for 528 feet, and 180 feet from the shaft a raise has been put through to the surface, all in ore. On the 200 foot level of the same vein there is pay ore for a distance of 420 feet. The No. 3 vein is showing a good width at the 200 foot level, but values run slightly lower, or between $8 and $12. Cross-cutting to the north from the Godfrey vein at the 100 foot level a two foot vein of quartz has just been intersected. At the time of writing this new ore body had not been sampled, but it has all the characteristics of other pay ore veins on the mine. There is now on the dump about 5,000 tons ready for the mill.

Quite a number of prospectors have gone into the Bell River District in Northern Quebec, where good discoveries are reported. The route lies along the Transcontinental east of Cochrane to the end of steel and then 90 miles along the grade to the Bell River, where most of the parties are encamped until the ice clears from the river and it is possible to get north.

Plans are complete for the ten stamp mill which is to be erected at the Swastika mill very shortly. At the 300 foot level of the mine a hundred feet of pay ore has now been opened up in a drift on the main vein, and the shaft is down almost to the 400 foot level, where it is intended to open up another level with all speed. Finds in Lebel and Eby Township on the Tough and other claims have awakened considerable interest in claims, and several transfers of property are reported.

In Burt Township, at Swastika, the report of the discovery of native silver has led to a revival of prospecting and staking. Round Kirkland Lake there is also some activity.

It is stated that Daniel O'Connor, well known to all visitors at Temagami in recent years, has made a discovery of nickel near Connaught or the Frederickhouse Lake station of the Porcupine branch of the T. & N. O. It is thought that this is a continuation of the ore body at the Alexo mine near Kelso.

Three companies holding Porcupine properties have recently been incorporated. These are the Canada Veterans Gold Mines, capital $1,000,000, Toronto; Porcupine Gold Leaf Mining Company, capital $1,000,000; and the Porcupine Christ Mines, capital $1,500,000, head office, Toronto.

Cobalt, South Lorrain, Elk Lake, and Gowganda.

The shipments in bullion for the month of March far exceeded any previous month in the history of the Cobalt camp. There was a grand total of 441,000 ounces. Of this amount the Nipissing alone shipped 43,705 ounces.

The Beaver Consolidated annual report shows that the production of the mine during the year amounted to 750,950 ounces, and cost of production was $149,066, an average of 19.85 cents per ounce. The profit and loss account shows the net earnings of the mine in 1911 were $223,097, out of which amount $169,125 was distributed in the form of dividends, and, after allowing depreciation, the balance carried over to surplus, which now amounts to $178,184. No estimate is made in the report of the ore reserves, and the veins are extremely erratic both in values and width.

The Lumsden mine on Beaver Lake is now working at the 300 foot level, where a crosscut is being driven from J. L. shaft to pick up two veins which were located upon the Rochester.

The Nipissing production in March was $225,058 net. The shipments during the month amounted to $257,706, of which amount $230,305 was bullion from the high grade mill, where 189 tons were treated during the month. Excellent results were obtained in development at the Meyer No. 100, and 64, but 122 is still diappointing.

The annual report of the Nipissing mine, as revealed in the statement by Mr. R. B. Watson, shows that net earnings were over $2,000,000. Notwithstanding that only a third of the annual prospecting was done in 1911, high grade ore reserves at the beginning of the year exceeded in value those of the previous year by more than $275,000. The reserves of the mine were increased during the year by $1,300,000, to a total of $4,572,000. The report shows that there remains 270 acres or about one-third of the total area still unprospected. The shipment of high grade ore amounted during the year to a value of $881,133. The total tons of ore shipped was 2,838,344, containing 2,512,950 ounces. Including bullion, the grand total output was $2,381,712, or 4,678,074 ounces, produced at a cost of 14 cents per ounce.

It is stated that the La Rose annual report will show that 3,691,797 ounces were produced during the year, the net value of which was $1,810,476. The cost of production averaged 19.20 cents per ounce, and the ore reserves were placed at 4,250,861 ounces, of an estimated value of $1,643,938, while the combined surplus amounts to $1,551,421 after paying dividends to the amount of $599,491.

The shaft at the Silver Cliff mine is now being dewatered with a view to opening up again at an early date. The property has been closed down now for almost a year after the mill had been in operation for only a very short time.

By a fire which broke out on the morning of April 11th, the sampling plant and refinery at the high-grade mill on the Nipissing property were destroyed. The damage is estimated at $5,000,000. Repairs were at once taken in hand and a new building has now almost been completed.

The Kerr Lake Mining Company has just declared a dividend of 5 per cent., payable on June 15th. With this disbursement the Kerr Lake will have paid 134 per cent., or a grand total of $4,020,000, in dividends.

ALBERTA.

The following notes, relating to only a few of the coal mining properties of Alberta, have been received from a correspondent of The Journal:

St. Albert Collieries.

On the property of the St. Albert collieries, situated eight miles northwest of Edmonton, along the Canadian Northern Railway, a reinforced concrete shaft is being put down through quicksand. This is stated to be the first mine shaft of this kind constructed in Canada. It is in the form of an open steel caisson supported by reinforced concrete. The shaft is being sunk with the object of cutting two seams of coal, of 8 and 6 ft. thickness respectively, and it is thought it will have to be put down to a depth of 320 ft. It is expected the first seam of coal will be reached by the end of May. This property is in what has been designated in Geological Survey reports as the Clover Bar coal horizon.

Pacific Pass Coalfields, Ltd.

The mines of the Pacific Pass Coalfields, Ltd., will be afforded railway transportation facilities by a branch line being constructed from Bikerdike, on the Grand Trunk Pacific Railway, 136 miles west of Edmonton. The branch line will be 156 miles in length, and it is thought it will be completed by the end of June. About 500 tons of coal a day could be shipped now if there were available the requisite facilities. A plant is to be put in to have a daily capacity of 2,000 tons, and it is planned to later make it equal to handling about double that quantity daily.

Lethbridge Collieries, Ltd.

The new and modern steel bankhead for the coal mine of the Lethbridge Collieries, Ltd., at Kipp, six miles west of Lethbridge, has been completed. This plant has a capacity for handling 1,800 tons of coal a day, but the mine is not yet opened on a sufficiently large scale to admit of a daily output of more than 500 tons being made. There will, however, be a

gradual enlargement of its producing capacity until it shall be practicable to put out coal, if required, to the full capacity of the bankhead equipment, which is to a large extent a duplicate of that at the Alberta Railway and Irrigation Company's Galt Collieries No. 6 mine. Two shafts have been sunk. The hoisting shaft is 17 ft. 6 in. by 22 ft.; it is divided into three compartments—two for hoisting and one for pipes and ropes. The cages are in balance and each carries two cars tandem. The air and material shaft is 10 ft. by 20 ft., divided into three compartments—two for air and one for material. Two main haulage ways have been driven below ground, one for full and the other for empty cars. Entries are driven off at right angles to the haulage ways. Horses were used for hauling during opening of mine, but endless rope or other suitable haulage will be substituted for them.

Western Coal and Coke Company.

It is expected that the Western Coal and Coke Company, which has opened a coal miue on Beaver Creek, in Pincher Creek District, Southern Alberta, will shortly be in a position to proceed with the installation of plant and machinery requisite for handling and shipping coal from this mine, at which true openings have been made in the same seams, preparatory to mining coal. The construction of a branch railway, about 13 miles in length, from the Canadian Pacific Railway Company's Crow's Nest line to the mine at Beaver Creek, commencing at a point between one and two miles west of Pincher station, has been in continuous progress since last summer, and the completion of this work before the close of April was looked for. Machinery will be sent in with as little delay as practicable, and the work of putting it in place be proceeded with expeditiously. An eventual output capacity of 2,000 tons of coal per diem is to be provided for. Meanwhile shipment on a smaller scale will be undertaken as soon as the requisite shipping facilities shall be available.

BRITISH COLUMBIA.

As the spring season comes on, conditions generally are less unfovourable to mining than during the winter. Frost and snow at the higher altitudes, and rain and bad roads at the lower, retard operations during the several winter months, so that in most districts the output of ore is smaller and operating costs are greater than when better climatic conditions prevail.

Higher prices for some of the metals are also having an encouraging effect on mining, especially where the chief product is copper. This metal is the most important marketable constituent of Boundary District ores, and of those mined by the Britannia Mining and Smelting Company on its large group of mineral claims situated on Britannia Mouutain, Howe Sound. In less degree owners of Rossland mines are also interested in the price of copper, but the ores of the bigger mines of that camp contain much more gold than do those of Boundary and Coast district mines.

From gold mines, both placer and lode, an increase in production in 1912 is expected. Placer gold mines in both Cariboo and Atlin Districts are well equipped for washing a large yardage of gold-bearing gravel, so it only remains for a sufficient supply of water to be obtained to ensure a total recovery of gold this year larger than that of last. The lode gold mines of Sheep Creek and other parts of Nelson Mining Division, and the Nickel Plate group in Hedley Camp, Similgameen, are expected to make a bigger output of gold than in 1911. The Hedley Gold Mining Company has already paid one 5 per cent. dividend this year, and it is not doubted that it will in 1912 equal its total of 25 per cent. ($300,000) paid in 1911.

Production of silver, lead, and zinc is largely from mines in the Kootenay Division—in Fort Steele Division of East Kootenay and Ainsworth and Slocan in West Kootenay. The St. Eugene mine in East Kootenay has been closed, its known payable ore bodies having been exhausted. The Sullivan group mine is, in part, taking the place of the St. Eugene. Last year there seemed to be good reason to hope that a fairly large output of lead ore would be made in 1912 by claims about Salmo, Nelson Division, but development of these has been somewhat disappointing, the ore found underground not having maintained the promise given by comparatively large showings near the surface. Notes on several Slocan mining properties follow:

Slocan.—The recent payment of a dividend by the Standard Silver-Lead Mining Company, owning and operating the Standard mine and concentrating mill in Four-mile Camp, near Silverton, marks what it is confidently expected will prove a new era in the history of mining in Slocan District—new as regards a resumption of dividend-paying, which it is reasonable to think will ere long be also practicable to other companies mining in the district. The development of the Standard mine has been extended over a number of years, during a part of which working expenses have been paid out of proceeds of ore mined and sold. A description of this mine, together with an outline of its history, was published in the Canadian Mining Jourual of December 1st, 1911. The mine came into public notice more particularly in 1910, late in which year somewhat sensational statements relative to it were sent out from Spokane, Washington. Fortunately, though, control of the company organized shortly afterwards to acquire and operate the mine, was retained by Messrs. John A. Finch, of Spokane, and Geo. H. Ayland, of New Denver, who persistently discouraged the publication of such gross exaggerations as were printed at that time in Spokane newspapers and later sent out from Nelson, B.C. Much silver-lead ore of good grade has been found in this mine, not only on No. 5 level, where there was an unusual width of clean galena, but as well on an intermediate level above, and on No. 6 level at about 190 ft. vertical depth below. Now that the winter is practically over at the lower altitudes of Slocan, an appreciably large increase in production of ore will most likey be made. Other operating mines in the vicinity of the Standard are those of the Van-Roi Mining Company and the Silverton Mines, Ltd., the latter known as the Hewitt-Lorna Doone group.

Lately newspaper despatches have been published to the effect that owing to the softness of the wagon road from the Rambler-Cariboo mine to the Canadian Pacific Railway at Three Forks, hauling ore has been temporarily discontinued. There is a large quantity of ore accessible on several levels of this mine—on the 1,200 and other levels above it, so that whenever conditions shall be favourable to its shipment, a considerable tonnage can be produced. Later, after completiou of construction of the railway spur, now being built from Three Forks past the Rambler-Cariboo to the Lucky Jim mine, and of the aerial tramway from the former mine down to its concentration mill close to the new track, there will not exist obstacles to uninterrupted shipment of ore as at present.

During the winter exploratiou work in the Deep mine of the Whitewater group was discontinued, but the further development of the outcrop mine was undertakeu by Retallack & Co., which syndicate is also mining sufficient ore to pay miniug expenses. The outlook is favourable for au improvemeut in the transportation situation, and the owners of this mine, and others also interested in mining in this part of the district, are hopeful that before the close of the current year they will again be provided with railway facilities for shipping out ore and gettiug in supplies, both at lower cost than is now possible. The position is somewhat similar in regard to the Lucky Jim mine.

GENERAL MINING NEWS

NOVA SCOTIA.

Westville.—The Maple Leaf Mine, Joggins Mines, which has been operated by John D. Betts for the last year, closed down last Wednesday. The manager of this mine has had some difficulty owing to the chief coal inspector of the I. R. C. condemning coal which was supplied them.

Inverness.—Inverness colliery is to have a briquette plant in the very near future for using up the slack coal, much of which has gone to waste in the past. The pitch for these plants is a bye-product of the Sydney steel plant. It is heated by dry steam and mixed with washed slack and after cooling we have the briquette, which is about the size and shape of a cake of tar soap.

Inverness.—Mackenzie & Mann, owners of the Inverness colliery and railway, are negotiating now for the purchase of the St. Rose mine near Cheticamp, and if they are successful in securing it they will begin developments on a large scale. Mackenzie & Mann own quite an extent of coal areas in that vicinity, but require a block of areas held by Hon. Wm. Roche, of Halifax, before they can begin operations. The Senator, it is said, will only sell at what Mackenzie & Mann regard as an exhorbitant figure, and the Canadian Northern twins are taking the matter up with the local government in an effort to purchase the block at a fair valuation.

ONTARIO.

Cobalt.—Vein 146 of the Nipissing is reported to have been cut on the Gould Consolidated at the 100-foot level. The vein appeared after about ninety feet of cross-cutting, and assays, it is claimed, much higher than anything yet found on the Gould. Development is to be pushed on this discovery. The lowering of Cart Lake by the town of Coleman this winter has added a large amount of dry land to the Gould area, enabling considerable surface prospecting the coming season, hitherto impracticable from the presence of surface water.

Cobalt.—During the past month development of vein 73 at the Nipissing continued favourable. This vein is still the main source of production at the Nipissing. During March it produced silver valued at $117,753. Development on veins 100 and 80 between the first and second levels is turning out well.

Cobalt.—Instructions have been received for the dewatering of the Silver Cliff mine at Cobalt, and the pumps are now at work pumping out the shaft and workings. This work will take some time, as there is a considerable amount of drifting done at the mine. The owners of the property are expected in Cobalt shortly, when they will inspect the mine and decide in what direction the development work should be continued. The Silver Cliff has been a producing mine since 1908, and was closed down last year after working for about three months, during which period 92.30 tons of ore were shipped and 2,363 ounces of bullion. The intention of re-opening the mine is of considerable interest to the section of the camp lying west of Cross Lake, and developments at the Silver Cliff will be watched closely.

Cobalt.—Mining interests have advanced greatly in Cobalt in the past three years. In 1908 the concentration of ore amounted to 42,424 tons, last year it amounted to 381,870 tons. The number of mills has been doubled, whereas in 1908 there were only seven mills, last year there were fifteen, thirteen of these being water concentrating mills and two cyanide mills. The increased concentration of the old mills is shown in the following table:

	1908 Tons.	1911 Tons.
Buffalo	10,200	43,930
Coniagas	13,605	53,150
King Edward	1,043	13,066
McKinley-Darragh	450	46,497
Nipissing Production	2,110	14,766

In the newer mines the concentrating output was: La Rose, 36,264; Temiskaming, 34,720; and Trethewey, 30,925.

Elk Lake.—Great activity prevails in the Elk Lake and Gowganda districts now that the Government has actually started the construction of the new railroad, and several properties have resumed work. In the Elk Lake section, the Regal, Donaldson, Willett-Cobalt, Bateese, Beacon, and Hitchcock are now being developed actively, and the Otisse, a property known to several, is preparing to again take up work. The shaft is full of water, but a pump is being put in to remove it. The owners of the MacDuff claims have added one more to their holdings and are bidding for two more that are adjacent to their property.

A car of ore carrying gold and silver values was recently shipped from the Mann property in Gowganda and excellent returns came from the consignment. The gross receipts were $38,000, and it cost $6,000 to get the ore to the steel and from there to its destination. The silver ran in the neighbourhood of 5,000 ounces and the gold values were $32 to the ton.

Elk Lake.—The plant of the Big Six has been purchased by the Regal, which will begin operations immediately under the able supervision of N. R. Morrison. The Regal adjoins the Donaldson, which has a large quantity of silver showing below the 100-foot level, and the same vein, which contains the silver on the latter property, runs directly into the Regal. The Donaldson machinery is being installed as rapidly as possible and the work will likely be completed in about two weeks. The plant recently installed in the Hitchcock is all ready to work, with the exception of the water supply, which is not quite ready. As soon as a supply is obtained for the boilers, operations will be begun putting down a shaft on this property.

Poreupine.—The Bewick-Moreing summer residence, on the east bank of Pearl Lake, the famous "club house," has been leased by Dr. H. H. Moore, who will conduct a general hospital for the camp. This action was taken as the result of the move on the part of the mine men for a miners' hospital in the western section.

The building is well suited for hospital purposes. Twenty large rooms, besides kitchen, dining-room, and store houses, and a large verandah that reaches around the west and south sides of the structure, afford every convenience for a sanitarium. The altitude is above that at South Porcupine, while pure springs of water run into Pearl Lake.

Poreupine.—The Porcupine Lake Gold Mines are continuing their diamond drilling on the Hunter-Dwyer claims, the work being done now from stages on the ice. It is intended to put down six more holes, and the work will be continued from the ice as long as possible and afterwards by aid of cribs. Indications are still very satisfactory and the extra holes are being put down with the object of charting the part of the property of the company that lies under the lake. With the completion of this chart it will be possible to ascertain the most advantageous point for sinking the shaft from which a crosscut will be run under the lake. It is expected that the work of sinking the shaft will be commenced in the near future and the property under the lake thoroughly prospected by drifting on the veins that have been located by the aid of the diamond drill.

Porcupine.—The last of the machinery for the Crown Chartered's new power plant has arrived and the work of placing the boilers and hoist will now be pushed with vigour. The management figures that steam should be turned on from the new plant withiu a few weeks.

Sinking in the main shaft is now down to the 190-foot depth and the 200-foot level will be reached before the week is out. Cross-cutting will go on at the 200-foot level also, while the sinking of the shaft to the 300-foot is also under way. Another level will be cut at the 300-foot depth. Work in the up-rises and drifting on the lead at the 100-foot depth are pursued vigorously. Three levels are to be driven during the summer.

Porcupine.—The Hollinger is to have a new 15-drill compressor in addition to the large one now working. The new machinery will be installed at once.

With the additional power for drilling the Hollinger will be able to run 15 drills besides the 15 now in operation.

A total of from 750 to 800 feet in the underground a month is being made, and with the additional 15 drills this amount of development will be practically doubled each month.

Porcupine.—It is announced that work on the Wallberg power dam at Waiwaitin Falls is to begin at once, following a long suspension of activity on account of financial difficulties, and that all back cheques are being taken up. Forty carloads of material for use at the plant have been shipped to Timmins siding, and more sidings are being laid to accommodate other cars which are expected to arrive this week with large consignments for use at the Falls.

Winter roads are now thawed out, and all the machinery will have to be shipped by scow up the Mattagami River from Timmins Landing. Fifty teams of horses were taken from the Waiwaitin camps last week at the last moment, when they could be gotten out over the roads.

At the Falls the power plant is about half completed, the tubes all laid, and the sand hauled for the cement work on the dam.

Porcupine.—While the ten-stamp mill at the Dome Lake Mining Company has been decided upon, the process to be adopted will not be singled out until results are obtained from the test run at Kingston, although it is probable that it will follow the pattern of the McIntyre mill. The management claims that they have enough ore in sight to pay for the mill, and if the property then makes a mine they will know exactly what ore they have got and what profit they can make with further work.

Sudbury.—The streams are open and the lake ice not safe for travel. Some prospectors have just arrived in town, tired and foot-sore, but with courage still up to the fighting point.

The Mond Nickel Company's dryhouse at the Frood was totally destroyed by fire.

Smith & Durkee have started two drills on the International Nickel Company's property at the Frood.

BRITISH COLUMBIA.

Nelson.—The management of the Mother Lode mine hopes to commence crushing ore at the new mill by May 1.

Men are already at work in the mine and at the mill preparing for the commencement of the season's operations. At present the air pipes are being given their final test.

Rossland.—The Consolidated Company has purchased the Virginia mine, adjoining the Centre Star group, for $3,500. This was the highest bid received, although it was advertised as far east as Toronto. The Virginia was one of the live properties of the early days, when George Ofunder was superintendent. The company was capitalized for $500,000. The $3,500 will just about cover the accumulated debts.

Phoenix.—R. Gosse, representing the Canadian Consolidated Company, arrived in town recently and has been engaged for some days in removing and shipping the large 400 horse-power motor from the Snowshoe mine, the lease of which was thrown up some months ago. With the exception of one-half section of the compressor, the property of the Consolidated, which is still standing, all the machinery of value has now been removed. The motor was shipped to Trail.

Vancouver.—Details of extensions and improvements at the mines of the Canadian Collieries (Dunsmuir), Ltd., in the Cumberland field on Vancouver Island, involving an expenditure of nearly $2,000,000, was discussed at a conference held here recently between A. D. McRae, managing director; William Murray, a director; W. L. Coulson, of Victoria, general manager, and F. Perry, of Montreal, Canadian representative of Labard Bros., a Parisian banking house which is heavily interested in the enterprise.

Mr. Coulson stated that at least 1,000 additional men will be employed in connection with the various improvements within the next thirty days. A contract for the extension of the standard gauge railway line to the new No. 8 mine in the Cumberland field, a distance of six and one-half miles, has just been awarded to Clarence Hoard, of Victoria. The shaft is down 70 feet, and it will be extended to a depth of 1,000 feet to tap the coal seams proven up by diamond drills, three of which are still engaged exploring the field. The coal output a year hence, it is expected, will nearly be doubled and brought up to 5,000 tons daily. The company will build 200 new miners' dwellings at the No. 8 mine this summer, and 75 at the old mines at Cumberland, where 25 cottages were built last year. The hydro-electric plant on the Pundledge River will be completed next fall and will provide an electrical energy for operating all the mining plants in the field. It will furnish six thousand horse power, the capacity of which will be doubled later as requirements justify. The fans will also be operated by electricity, following the system in vogue at the Extension field near Ladysmith, where a new generator was installed in February.

It is not proposed to increase at present the coal output in the Extension field, which now produces 1,200 tons daily. The coal bunkers and wharf capacity at Ladysmith and Comox are also being enlarged.

Vancouver.—The prospect of the early establishment of direct railway communication with Vancouver via the Hope Mountain route, is stimulating mining development in the Similkameen district, according to Ernest Waterman, of Princeton, general manager of the Princeton Coal & Land Company, who, with A. Hickling, advisory director, of London, England, is at the Hotel Vancouver. His company, owning three square miles of coal lands at Princeton, lately installed a plant capable of handling an output of 500 tons daily, mostly supplied to the home market, but arrangements have been made to ship 300 tons daily to Spokane over the Great Northern Railway. The import duty is 45 cents per long ton.

Vancouver.—A deal for the consolidation of the principal copper-gold groups, embracing over fourteen claims in White Horse camp, Yukon district, has been completed by Robert Lower, of White Horse, who has spent the past winter in this city. It involves the payments at various periods within the next two years, the first payments in some instances maturing within twelve months. The various groups have been transferred to the New Atlas Mining Company, of Chicago, which has already been financed.

Forty-five miners will leave Seattle April 17th for White Horse, to start development work, which it is proposed to carry out on a very extensive scale. Within a few weeks regular shipments will be made to the Tacoma smelter. This result will be made possible by the general reduction in freight rates over the White Horse & Yukon Railway between White Horse and tidewater at Skagway. The rate on copper ore has been

fixed at $2 per ton, a figure these comparatively low grade ores, it is expected, will be able to stand without any handicap, as a low rate transportation by water for the remainder of the haul has been secured.

Mr. Greenough will be the general manager of the new company, with John Mocine, of Seattle, as superintendent. Mr. Greenough will take in a large amount of drills and other machinery, as it is the intention to make a thorough examination of several of the properties which show less development than other members of the various groups.

Vancouver.—R. P. Rithet and the Drexel estate, of San Francisco, have just sold the property of the Ward Horsefly Gold Mining Co., Ltd., an hydraulic proposition on Horsefly River, Caribou district, to S. P. Dunlevy and Robert T. Ward, of San Francisco. The new owners intend to operate the plant this season, and a big gang of men is now on the ground getting matters in shape.

The property comprises a lease of the riverbed, a discovery claim and benches embracing 360 acres. Testing the ground with keystone drills during the past winter, Messrs. Dunlevy and Ward, it is said, proved it to average 75 cents per cubic yard, which is considered exceptionally good. Two years ago 100,000 cubic yards were sluiced, the gold production being $182,000, and the return of the last two weeks' run was $11,-500. The equipment comprises three miles of 30-inch steel pipe with a flow of 3,500 miners' inches, exerting 300 pounds pressure to the square inch, and monitors as well as an electric lighting plant. The water supply is derived from Moffett Creek, which is a large stream all the year round. The new company will be a close corporation. It is styled the Horsefly River Gold Dredging & Mining Company, Ltd.

Prince Rupert, April 16.—The large freightage on the railway will be largely increased this spring by the immense amount of mining machinery that will be required in the Hazelton and Omineca districts. Several companies are talking of installing hoisting and compressor plants in order to get out sufficient ore to make regular shipments as soon as the railway reaches them, while the old placer mines of Omineca are this summer to be worked on a great scale and by similar hydraulic methods as those put into successful operation by the Guggenheims in the Yukon.

There are two large companies in the Omineca who will operate on a large scale this summer, one of which is backed by Toronto capital and on which Mr. Beaudette spent last summer and the summer before, and when he left Rupert last fall reported that his company would operate as soon as the frost was out of the ground this year. Mr. Beaudette is expected back in a few days to start these operations, the principal holdings of the company being on Manson Creek.

The other company, the Royal Standard of Vancouver, will be represented this season by R. D. Featherstonhaugh, who from 1906 to last year was the engineer and manager of the North Columbia Gold Mining Co., of Atlin. In addition to installing an hydraulic plant on the property of the Standard on Germanson Creek, near its junction with the Omineca River, he will have with him an expert on dredging, the proposition being to work the gravels by steam dredges, as is now being done so successfully in Yukon and also in California and Colorado.

Those two propositions alone mean the transportation of many carloads of machinery and supplies, and the employment of a large number of miners.

Nanaimo, April 10.—Superintendent W. A. Wilson, of the Canadian Explosives Company, was killed and a labourer named W. Woods was seriously injured in an explosion at the works at Northfield this morning about 10 o'clock. Other deaths were probably averted through the fact that a warning blast was given.

It is believed that Superintendent Wilson was not killed instantly, dying after the explosion. He was one of the most efficient men that has ever held the position here, and was about 40 years of age. He leaves a family.

Little is known of the labourer.

The explosion was caused by overheating of the nitrate mixer. When the employees found that this condition existed they left the building and summoned the superintendent from the office. Mr. Wilson was 200 feet from the building and approaching it when the powder went off. He was disembowelled.

COMPANY NOTES

ROBERTSON ASBESTOS COMPANY.

Asbestos propositions seem to have fallen on evil days. A short time ago Amalgamated Asbestos defaulted on its bond interest and had to be reorganized. Then the Black Lake Asbestos Company had a somewhat similar experience. Now the Robertson Asbestos Company is being sold by the trustees for the benefit of the bondholders. The company had mines in the neighbourhood of Thetford, P.Q. But, like all other asbestos mines in the neighbourhood, it felt the pinch of competition and lower prices. The asbestos market shows signs of reviving, but the improvement has come too late to help the existing companies.

PEARL LAKE GOLD MINES, LIMITED.

The Pearl Lake Gold Mines, Limited, head office in Toronto, and a considerable amount of stock in Montreal, has assigned. The following circular letter to shareholders has been mailed by B. E. Cartwright, the president:

"I regret to have to report to you that the company has been obliged to make an assignment for the general benefit of its creditors. The company still has in its treasury 251,000 shares of its stock, but during the last few months the market has been such that it has been impossible to sell treasury stock to meet current liabilities.

"Several creditors have commenced proceedings against the company to recover their claims, and it seemed to be best that the assets of the company should be placed in the assignee's hands to protect both the creditors and the shareholders.

"A complete plant with a capacity of twelve drills is installed on the property and a three compartment shaft has been sunk to the four hundred foot level. From this shaft a crosscut has been started to tap the valuable and extensive ore bodies located by diamond drill operations.

"I have every confidence that within a very few weeks I will be in a position to pay off all claims against the company and obtain a re-conveyance of the company's assets from the assignee to the company.

"I feel it my duty to advise and urge all shareholders not to sacrifice their holdings, but to retain their stock until arrangements are completed as above and mining operations resumed."

Mr. Cartwright has not been a model of discretion or of unselfishness in his management of affairs.

REA.

Underground work has been stopped at the Rea and temporarily, at least, the vein will be shut down. For the next two weeks at least the only development that will be done at the property will be diamond drilling.

The closing of the underground work is said to be only temporary, pending the annual meeting of the company, which will be held in Montreal. It is understood that complete reports of the results achieved at the property will be made known at that time.

THE WETTLAUFER LORRAIN COMPANY.

A summary of the report which accompanies the dividend cheques of the Wettlaufer Lorrain Company indicates that during the past quarter there were produced 264,683 ounces of silver at a cost of production of 19½c per ounce, resulting in a net profit of $102,206. There was expended on property acquired and options $22,348. Prospecting is in progress and the main winze is to be carried down 100 feet below the fifth level. In several cases where stoping was carried on in the original blocks of ore estimated, the pay ore did not maintain its width and values throughout. This was given full weight in making up the estimate of ore reserves as of December 31st.

The Keeley property, which was held under option and on which some work was done, has been relinquished as the results were discouraging. At the Silver Eagle property good results have been obtained. High grade ore was encountered on the fourth level, and an up-raise has been driven for 30 feet, and still continues in excellent ore, running several thousand ounces to the ton and showing a vein from one to four inches wide.

Since the report was written a shipment of 15 tons was made, showing contents to be 4,702 ounces of silver per ton. Word has also been received to the effect that a decided improvement has been made in one of the stopes now being worked in the mine, bunches of high-grade ore appearing, having a width from 3 to 6 inches and assaying 3,000 ounces of silver per ton, where only milling ore was anticipated.

CONIAGAS DIVIDEND.

The directors of the Coniagas mines omitted their three per cent. bonus from their dividend for the second quarter of 1912, and instead of the 6 and 3 per cent. dividend, declared six per cent, payable on May 1. The dividend calls for a disbursement of $240,000, and is a total disbursement of $3,440,000, or 86 per cent. of the total capitalization. Coniagas directors went on a 36 per cent. basis the first of last year, and have been distributing the dividends in nine per cent. quarterly payments since that time. Although the extra bonus was earned by the company during the past three months, they have decided to omit it for this quarter in the dividend checks. The Coniagas dividend record reads:

1907	9	$ 360,000
1908	11	440,000
1909	9	300,000
1910	6	240,000
1911	36	1,440,000
1912, Feb. 1	9	360,000
May 1	6	240,000
	86	$3,440,000

LA ROSE STATEMENT FOR 1911.

The La Rose Consolidated Mines Co. reports for the year ended December 31, 1911, as follows:

Dividends received	$627,000
Administration expenses, etc.	33,319
Dividends paid	599,451
Deficit	5,770
Previous surplus	13,361
Profit and loss surplus	7,591

The combined income account of the La Rose Mines, Limited, and University Mines, Limited, for the year ended December 31, 1911, follows:—

Gross value of ore	$1,977,765
Other income	30,362
Total income	2,008,126
Cost of mining and other expenses	739,041
Profit	269,086
Dividends	627,000
Surplus	642,086
Reserve deduction	16,497
Previous surplus	904,367
Combined profit and loss	1,529,956

For the seven months ended December 31, 1910, the operating companies showed a surplus after dividends of $596,408.

NIPISSING REPORT FOR 1911.

The Nipissing Mines Company has issued its report for the year ended December 31, 1911. The income account of the Nipissing Mining Company, Limited, the operating company, compares as follows:

	1911.	1910.	1909
*Output	$2,820,257	$2,984,084	$2,462,037
Other income	47,168	52,669	40,320
Total income	2,867,425	3,036,753	2,502,359
Operating costs	772,184	869,649	857,491
Net profit	2,095,251	2,167,103	1,644,869
Prev. surp.	952,799	913,195	803,326
Dividends	1,843,297	2,127,500	1,535,000
P. & L. surplus	1,204,743	952,799	913,195

*Including value of ore on hand, in transit, and in process of refining.

The income acount of the Nipissing Mines Company for the year ended December 31, 1911, compares as follows:

	1911.	1910.	1909
Div. on Nip. min. stock	$1,843,297	$2,127,500	$1,535,000
Interest	22	199	301
Income	1,843,319	2,127,699	1,535,301
Dividends	1,800,000	2,100,000	1,500,000
Admin. ex.	51,290	41,289	22,018
Deduct.	1,851,290	2,141,289	1,522,018
Deficit	7,971	13,500	*13,282
Prev. surp.	8,381	21,971	8,688
P. & L. surp.	410	8,381	21,971

*Surplus.

President E. P. Earle says: The results obtained from the operation of your properties last year were very gratifying.

The cost of producing silver, including every item of expense, was under fourteen cents per ounce.

Because our hydraulic plant was not delivered in time for operation last year, only about one-third the usual amount of prospecting was done. Notwithstanding this the high grade ore reserves on January 1, 1912, exceeded in value those of the previous year by over $275,000. Including the accumulated low grade ore on the dumps (but not considering the large amount of this class of ore in the mines) the reserves were increased during the year by $1,300,000 to a total of $4,572,000. This is the largest ore reserve ever shown by the company.

The experience gained from the treatment of high-grade ores, having shown that our low-grade ore can also be treated profitably, a 200-ton mill is now being erected for that purpose. It is expected that this will be in operation late this year, and it is certain that the milling of these ores will add largely to the company's income.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

The following table shows the Cobalt ore shipments for the week ending April 13th, and for the year to date:

	Week.	Year to date.
Beaver	60,000	183,988
Buffalo	.....	710,532
Can. Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers-Ferland	.....	192,000
City of Cobalt	.....	226,293
Cobalt Lake	.....	270,680
Cobalt Townsite	111,000	646,744
Colonial	.....	40,000
Coniagas	230,319	1,228,776
Crown Reserve	.....	298,569
Drummond	.....	604,000
Hudson Bay	61,086	437,830
Kerr Lake	108,469	493,282
La Rose	126,200	1,886,682
Mann (Gowganda)	.....	40,000
McKinley	61,900	1,568,498
Millerette	.....	126,000
Miller Lake O'Brien	50,000	146,500
Nipissing	80,400	1,189,222
O'Brien	.....	398,970
Provincial	.....	44,440
Rght-of-Way	.....	220,296
Temiskaming	76,800	564,539
Trethewey	56,165	272,635
Wettlaufer	56,000	216,470
Total	1,022,239	12,649,577

The fire at the Nipissing this week interfered to some extent with their bullion shipments and the total for the week is consequently lower than usual. The Nipissing made only one shipment early in the week to New York and the Trethewey also figured among the shippers with a small shipment to London. The shipments for the week are as follows:

	Ounces.	Value.
Nipissing	39,411.00	$23,006
Trethewey	1,696.18	990
Totals	41,107.18	$23,996

The following table shows the Cobalt ore shipments for the week ending April 20th, and for the year to date:

	Week.	Year to date.
Beaver	.....	188,988
Buffalo	56,340	766,872
Can. Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers-Ferland	67,200	259,200
City of Cobalt	65,419	291,712
Cobalt Lake	.....	270,680
Cobalt Townsite	.....	646,744
Colonial	.....	40,000
Coniagas	.....	1,228,776
Crown Reserve	40,900	399,469
Drummond	.....	604,000
Hudson Bay	62,967	500,797
Kerr Lake	.....	493,282
La Rose	232,440	2,119,122
Mann (Gowganda)	.....	40,000
McKinley	137,094	1,705,592
Millerette	30,000	156,000
Miller Lake O'Brien	.....	146,500
Nipissing	.....	1,189,222
O'Brien	.....	398,970
Provincial	.....	44,440
Right-of-Way	.....	220,296
Temiskaming	.....	361,539
Trethewey	.....	272,635
Wettlaufer	.....	216,470
Totals	692,360	13,311,937

The shipments of bullion for the week are as follows:

	Ounces.	Value.
Buffalo	6,168.00	$3,654.54
Kerr Lake	2,244.50	1,329.57
O'Brien	20,662.00	11,983.00
La Rose	20,636.00	11,801.53
Temiskaming	2,322.50	1,358.00
Drummond	1,198.70	709.81
Totals	53,231.70	$30,836.45

The bullion shipments for the year to date are as follows:

	Ounces.	Value.
Nipissing	1,124,500.52	$647,584.30
Crown Reserve	201,143.00	112,678.85
Temiskaming	56,833.00	33,804.96
O'Brien	72,834.47	40,176.85
Nova Scotia	49,010.00	31,800.00
Buffalo	31,438.00	18,214.54
McKinley-Darragh	2,528.00	1,390.37
Kerr Lake	4,566.25	2,678.67
Trethewey	5,703.66	3,238.00
City of Cobalt	1,618.40	1,000.00
Miscellaneous	7,869.64	4,511.81
Totals	1,558,044.94	$897,078.35

BRITISH COLUMBIA ORE SHIPMENTS.

Consolidated Company's Receipts.

The production and shipments to the Consolidated for the week ending April 6th were:

	Week.	Year to date.
Rossland—		
Centre Star	2,986	42,003
Le Roi	1,464	12,723
Le Roi No. 2	571	6,028
East Kootenay—		
Sullivan	585	7,023
St. Eugene	....	401
Society Girl	....	21
Ainsworth—		
Utica	....	132
No. 1	....	311

	Week.	Year to date.
Slocan—		
Standard	172	2,569
Van Roi	....	1,110
Hewitt	31	90
Ottawa	....	59
Eastmount	....	57
Fidelity	....	61
Apex	....	36
Richmond-Eureka	....	443
Rambler-Cariboo	....	411
Reco	....	24
Lone Bachelor	....	31
Ruth	....	259
Middleton	....	24
Other mines	....	228
Nelson—		
Canadian King	....	54
Arlington	....	670
Nugget	....	44
Granite-Poorman	30	100
Queen	....	110
Emerald	....	833
Vancouver	....	17
Devlin	....	11
Molly Gibson	191	335
Silver Cup (Lardo)	....	86
Monarch (Field)	....	114
Foreign—		
Knob Hill	110	1,176
Hope	....	20
Northport	...	34
Bonanza	....	80
Totals	6,140	76,391

The production and shipments to the Consolidated for the week ending April 13th, were:

	Week.	Year to date.
Rossland—		
Centre Star	2,911	41,914
Le Roi	1,708	14,431
Le Roi No. 2	355	6,383
Bluebird	.....	57
East Kootenay—		
Sullivan	736	7,759
St. Eugene	.....	401
Society Girl	.....	21
Ainsworth—		
Utica	.....	132
No. 1	19	330
Slocan—		
Standard	168	2,737
Van Roi	30	1,140
Hewitt	.....	90
Ottawa	.....	28
Eastmont	.....	51
Fidelity	.....	61
Apex	.....	36
Richmond-Eureka	30	473
Rambler-Cariboo	.....	411
Reco	.....	24
Lone Bachelor	.....	31
Ruth	.....	259
Middleton	.....	24
Nelson—		
Canadian King	.....	54
Arlington	.....	670
Nugget	.....	44
Granite-Poorman	.....	100
Queens	.....	110
Emerald	.....	833
Vancouver	.....	17
Devlin	.....	11
Molly Gibson	72	407
Silver Cup (Lardo)	...	86
Monarch (Field)	29	143
Foreign—		
Knob Hill	74	1,250
Northport	....	20
Hope	....	34
Bonanza	....	80
Totals	6,132	82,523

BOUNDARY ORE TONNAGES.

Following are the returns of the output of the mines and smelters of the Boundary District for the week ending April 5th, and year to date:

Granby	24,502	315,166
Mother Lode	7,805	108,938
Rawhide	5,854	38,856
Jack Pot	378	8,188
Others	241	3,106
Smelter Tonnages.		
Granby	24,140	361,127
B. C. Copper Co.	12,120	157,613

For the week ending April 12th, and year to date:

Granby	24,666	339,832
Mother Lode	7,524	116,462
Rawhide	3,682	42,538
Jack Pot	.....	8,188
Others	191	3,297
Smelter Tonnages.		
Granby	23,655	384,782
B. C. Copper Co.	13,141	170,754

B. C. SMELTING.

In the past year the smelters of the Kootenay and Boundary districts smelted 1,362,244 tons of ore and concentrates. Of this tonnage the Granby smelter at Grand Forks treated 599,855 tons, and the B. C. Copper Company's smelter at Greenwood, 431,708 tons. The smelter of the Consolidated Mining & Smelting Co. of Canada at Trail treated 330,681. Ores and concentrates treated from the Boundary district totalled 1,065,687 tons; from Rossland district, 239,520 tons; from East Kootenay, 33,110 tons; from the Slocan district, 8,863 tons; from the Ainsworth district, 606 tons; from the Nelson district, 7,412 tons; from the Lardeau district, 782 tons. Five properties in the State of Washington shipped 6,237 tons to Trail smelter.

COBALT BULLION SHIPMENTS FOR MARCH.

The summary of the bullion shipments from Cobalt for March shows that the camp sent out 441,451.20 ounces, valued at $257,597.81, an immense advance on the average monthly shipment of last year, which was 314,410 ounces, valued at $167,702.80. With the March shipments Cobalt reached a record for bullion shipments.

NIPISSING PRODUCTION FOR THE QUARTER.

The Nipissing for the first quarter of this year shipped $916,912 net in ore from a production of 1,179,470 ounces. The figures for last month were: shipped, $257,000; of which $203,305 was bullion, and produced 386,978 ounces; net value, $225,058.

SHARE MARKET.

(Courtesy of J. P. Bickell & Co.)

April 25th, 1912.

Cobalt Stocks.

	Asked.	Bid.
Bailey	.02½	.02
Beaver Consolidated	.45	.43½
Buffalo	1.75	1.50
Chambers-Ferland	.15½	.14½
City of Cobalt	.16½	.15½
Cobalt Lake	.27	.26
Coniagas	7.20	6.90
Crown Reserve	3.30	3.20
Great Northern	.11	.09
Gould	.03⅜	.03
Gifford	.04½	.03½
Green-Meehan	.01¾	.01¼
Hargraves	.08½	.07½
Kerr Lake	2.95	2.85
La Rose	.75	.68
McKinley-Darragh	1.70	1.66
Nipissing	8.10	8.00
Nova Scotia	.04½	.03
Ophir	.10	.08½
Otisse	.02	.01⅜
Peterson Lake	.09	.08
Rochester	.03	.02⅜
Right of Way	.12½	.11
Temiskaming	.45	.44
Trethewey	.60	.56
Wettlaufer	.64	.63

Porcupine Stocks.

	Asked.	Bid.
Apex	.04	.03½
Dobie	.75	.50
Crown Chartered	.29½	29
Dome Extension	.54½	53½
Eldorado	.08½	.06
Foley-O'Brien	.25	22½
Hollinger	11.55	11.50
Jupiter	.40	.38½
Moneta	.15	.13
Pearl Lake	.14	.11
Porcupine Imperial	.04¾	.04
Porcupine Tisdale	.05	.04⅛
Preston East Dome	.06½	.06
Rea	.60	.51
Standard	.04¼	.04
Swastika	.23	.22½
Vipond	.39	.37½
United	.03	.02
West Dome	.20	.25 ¼
Big Dome	.28	.30

Sundry

	Asked.	Bid.
Island Smelters	.09½	.10
Canadian Marconi	.07½	.08

New York Curb.

	Asked.	Bid.
Braden	5	5¼
B. C. Copper	5¼	5⅜
Butte Coal	22¾	23¼
Giroux	5¾	6⅞
Green-Cananea	9	9¼
Inspiration	19⅛	19¾
Yukon Gold	3½	3⅝
Nevada Hills	2¼	2 5/16
United Copper	1½	1¾

TORONTO MARKETS.

April 24—(Quotations from Canada Metal Co., Toronto)—
Spelter, 6.85 cents per lb.
Lead, 4.50 cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 46 cents per lb.
Copper, casting, 16.50 cents per lb.
Electrolytic, 16.50 cents per lb.
Ingot Brass, 7 to 12 cents per lb.

April 24—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto)—
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

April 22—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $2.65 to $2.75 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.
April 22—Tin, Straits, 44.70 cents.
Copper, Prime Lake, 15.95 cents.
Electrolytic copper, 15.80 cents.
Copper wire, 17.00 cents.
Lead, 4.20 cents.
Spelter, 6.90 cents.
Shet zinc (f.o.b. smelter), 8.65 cents.
Antimony, Cookson's, 8.00 cents.
Aluminium, 19.50 to 20.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $41.00 per 75-lb. flask.

SILVER PRICES.

	New York. cents.	London. pence.
April 9	58⅜	26⅞
April 10	58⅜	26⅞
April 11	58⅝	27
April 12	58½	26 15/16
April 13	58⅝	27
April 15	58⅜	26⅞
April 16	58½	26 15/16
April 17	58⅞	27⅛
April 18	59¼	27 5/16
April 19	59⅜	27⅜
April 20	59⅜	27⅜
April 22	59⅜	27 5/16

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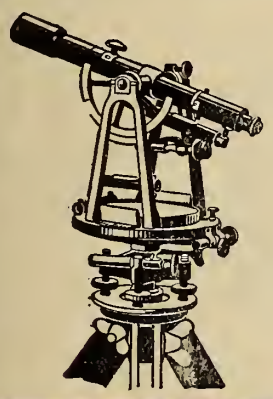

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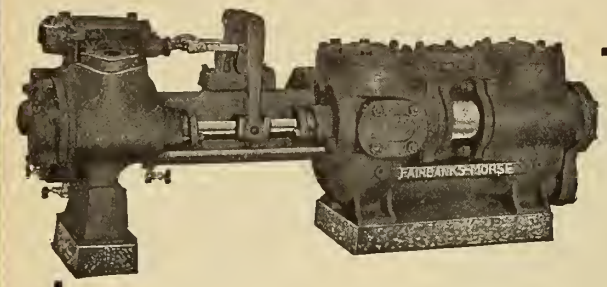

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

ONTARIO

1137. Memoir No. 10. An instrumental survey of the shore lines of the extinct lakes Algonquin and Nipissing in South-western Ontario, by J. W. Goldwait.

1213. Memoir No. 28. The Geology of Steeprock Lake, Ontario, by Andrew C. Lawson. Notes on Fossils from Limestone of Steeprock Lake, Ontario, by Charles D. Walcott.

NORTH WEST PROVINCES

1115. Memoir No. 8. The Edmonton Coal Field, Alberta, with maps, by D. B. Dowling.

1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

BRITISH COLUMBIA

1139. Memoir 11-T. Triangulation and Spirit Levelling of Vancouver Island, 1909, by R. H. Chapman.

YUKON and NORTH WEST TERRITORIES

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

1130. Memoir No. 9. Bighorn Coal Basin, Alberta, by G. S. Malloch, accompanied by a map.

MAPS RECENTLY ISSUED:

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1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

1084. Geological Map of Canada. Scale 100 miles to 1 inch.

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1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

NEW BRUNSWICK

1155. Map 24A. Millstream Iron Deposit, Gloucester County, N.B., geological and topographical. Scale 400 feet to 1 inch.

1156. Map 25A. Nipissiguit Iron Deposit, Gloucester County, N.B., geology and topography, scale 400 feet to 1 inch.

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1112. Map 12A. Vicinity of the Trancontinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.

1180. Map 34A. Vicinity of the National Transcontinental Railway, between the counties of Levis and Temiscouata, Quebec. Scale 8 miles to 1 inch.

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1091. Map 8A. Lake Nipigon, Thunder Bay District, Ontario. Scale 4 miles to 1 inch.

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1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

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792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.

1123. Map 17A. Southern Vancouver Island, British Columbia. Scale 6 miles to 1 inch.

1198. Map 48A. Tulameen Coal Area, Yale District, B.C. Scale ½-mile to 1 inch.

1136. Map 16A. Phoenix, British Columbia, geological. Scale 400 feet to 1 inch.

1148. Map 20A. Victoria sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

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   - (h) Sanitary Engineering.
   - (i) Power Development.

For Calendar of the School and further information apply to The Secretary, School of Mining, Kingston, Ontario.

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $71,213,103; Lode Gold, $60,811,067; Silver, $31,095,602; Lead, $24,645,605; Copper, $60,743,405; Other Metals (Iron, Zinc, etc.), $1,083,172; Coal and Coke, $114,012,596; Building Stone, Brick, etc., $10,593,100; making its Mineral Production at the end of 1910 show an

Aggregate Value of $374,197,650

In 1910 the quantity of Ore mined was 2,216,428 tons, and of coal 3,139,235 long tons. The value of Minerals produced that year was: Placer Gold $540,000; Lode Gold, $5,533,386; Silver, $1,245,016; Lead, $1,386,350; Copper, $4,871,512; Coal and Coke, $11,108,335; Other Minerals, $1,692,473, making the

Total Value for 1910, $26,377,066

Lode-mining has only been in progress for about eighteen years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

Mineral Locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with mining Reports and Maps, may be obtained gratis by addressing

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PROVINCE OF QUEBEC

Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.

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Gold, Coal, Iron, Copper, Lead, Tin, Manganese, Tungsten, and other minerals.

The Gold District covers more than three thousand square miles. Millions of dollars worth of gold have been taken from the gold fields of Nova Scotia and millions of dollars worth remain for recovery.

Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. W. H. HEARST,

Minister of Lands, Forests and Mines,

Toronto, Canada.

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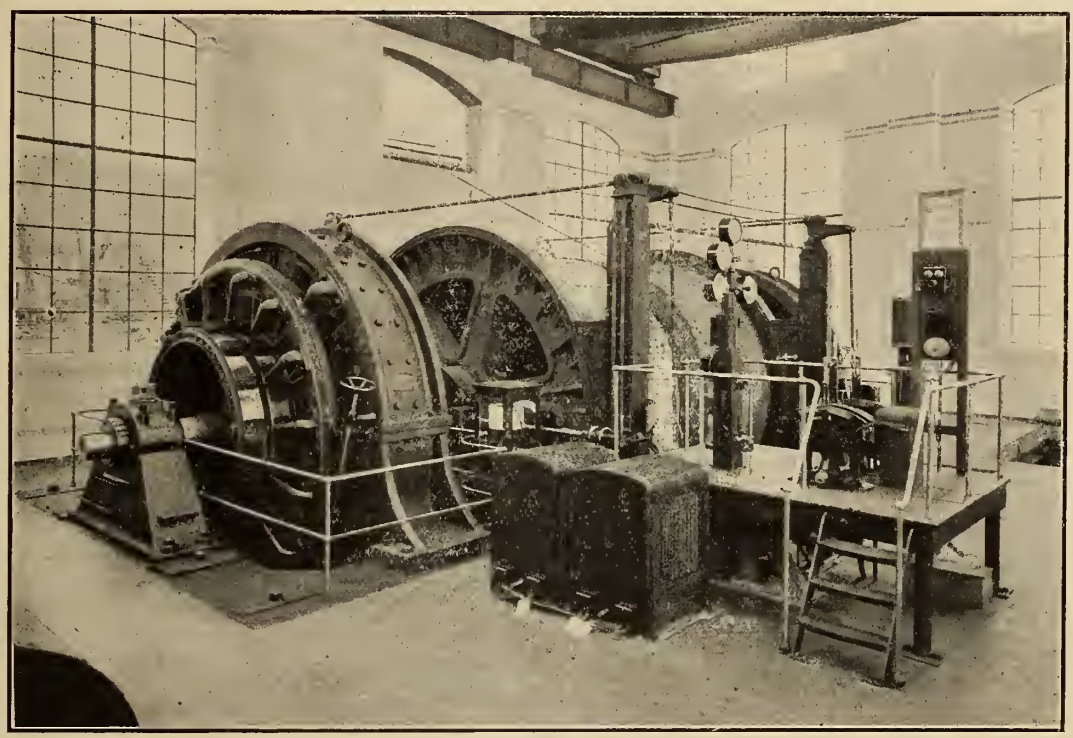

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John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
Engines—Haulage—
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.
Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Engines—Oil—
Jenckes Machine Co.
Peacock Bros.
Engines—Steam—
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Engines—Traction—
E. Leonard & Sons.
Jenckes Machine Co.
Excavators.
Jeffrey Mrg. Co.
Mussens, Limited.
Fans—Ventilating—
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.
Feeders—Ore—
Smart-Turner Machine Co.
Mussens, Limited.
Filters—
John McDougall Caledonian Iron Works.
Fire Extinguishers—
Mussens, Limited.
Forges—
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.
Forgings—
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.
Foundry Equipment—
Sullivan Machinery Co.
Furnaces—Assay—
Lymans, Limited.
Mussens, Limited.
Fuse—
Allis-Chalmers-Bullock.
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.

Continued on page 36.

Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.
Main Western Office - VICTORIA, B.C.

SUCCESSORS TO

Hamilton Powder Co. Ontario Powder Co.
Standard Explosives Ltd. Acadia Powder Co.
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Kaslo, B.C. Cranbrook, B.C. Beaton, B.C. Silverton, B.C.

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Beloeil Station, P.Q. Windsor Mills, P.Q. Vaudreuil, P.Q. Nanaimo, B.C.
Northfield, B.C. Bowen Island, B.C.

Canadian Miner's Buying Directory.—(Continued from page 34.)

Canadian Explosives.
Mussens, Limited.

Gears—
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

Generators—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.

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Mussens, Limited.

Ground Detectors—
Canadian Westinghouse.

Galvanized Strand—
B. Greenings Wire Co., Ltd.

Girders—Steel—
Dominion Bridge Co.

Heaters—Feed Water—
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.

High Speed Steel Twist Drills—
Mussens, Limited.

Hoists—Air, Electric and Steam—
Canadian Rand Co.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.

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Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.

Hoists—Gas and Gasoline—
Mussens, Limited.
Waterous Engine Works.

Hoists—Pneumatic—
Mussens, Limited.

Hoisting Ropes—
Allan, Whyte & Co.

Hose—
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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Rand, Ltd.
Allis-Chalmers-Bullock.
Can. Cleveland Drill Co.

Injectors—
Mussens, Limited.
Peacock Bros.

Jacks—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Jigs—
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Lamps—Acetylene—
Mussens, Limited.

Lamps—Arc—
Canadian Westinghouse.

Lamps—Incandescent—
Canadian Westinghouse.

Lamps—Safety—
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.

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Canadian Westinghouse.

Levels and Rules—
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John Davis & Sons.
T. Eaton Co.

Lighting Systems—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Lights—Dump—
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Can. Fairbanks-Morse Co.

Lights—Mine Bldg—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Lime Machinery—
Allis-Chalmers-Bullock.

Link Belt—
Watrous Engine Works.
Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse

Lubricators—
Peacock Brothers.

Machinists—
Smart-Turner Machine Co.

Metal—Bearing—
Canada Metal Co.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Meters—
Canadian Westinghouse.

Mica Dealers—
Canada Metal Co.
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.

Monel Metal—
Orford Copper Co.

Motors—
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Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.

Nickel—
Can. Copper Co.

Ore Sacks—
Can. Bag Co.
Can. Fairbanks-Morse Co.

Ore Samplers—
Can. Laboratories.
Campbell & Deyell.

Ore Testing Works—
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
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Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

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Paints and Oils—
Paterson Mfg. Co.

Pebble Mills—
Hardinge Conical Mill Co.

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Allis-Chalmers-Bullock.

Pick Machines—
Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
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Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
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Consolidated Mining & Smelting Co.
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E. Leonard & Sons.
Jeffrey Mfg. Co.
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Mussens, Limited.
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Mussens, Limited.
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Canadian Westinghouse.
Can. Kellogg.

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Can. Cleveland Drill Co.
Canadian Rand Co.
Peacock Brothers.
Jones & Glassco.

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Canada Producer & Gas Engine Co.
E. Leonard & Sons.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.

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Smart-Turner Machine Co.
Jeffrey Mfg. Co.

Pielsometers—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Pulverizers—
Jeffrey Mfg. Co.

Pumps—Boiler Feed—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.

Pumps—Centrifugal—
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Canadian Rand Co.
Laurie & Lamb.

Pumps—Electric—
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.

Pumps—Pneumatic—
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Mussens, Limited.
Smart-Turner Machine Co.

Pumps—Rotary—
E. Leonard & Sons.

Pumps—Sand—
E. Leonard & Sons.

Pumps—Sinking—
Mussens, Limited.
E. Leonard & Sons.

Pumps—Steam—
Canadian Rand Co.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

Pumps—Turbine—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.

Pumps—Vacuum—
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Smart-Turner Machine Co.

Quarrying Machinery—
Can. Cleveland Drill Co.
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Canadian Rand Co.

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Campbell & Deyell.

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Peacock Bros.
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Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.

Separators—
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Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

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American Grondal Co.
Wetherill Magnetic Separating Co.

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Shovels—Steam—
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M. Beatty & Sons.

Slime Tables—
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

Smelting Machinery—
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Allis-Chalmers-Bullock.
Peacock Brothers.

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Consolidated Mining & Smelting Co.

Sprayers—
Mussens, Limited.

Spray Nozzles—
K. Lindemann.

Stamp Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.

Steel Drill—
Sullivan Machinery Co.
Canadian Rand Co.
Peacock Bros.
Edgar Allen & Co.

Steel—Manganese—Castings—
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Hadfield's Steel Foundry Co.
Can. Steel Foundries.

Steel—Tool—
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Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Edgar Allen & Co.
N. S. Steel & Coal Co.

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Dominion Bridge Co.

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Surveying Instruments—
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Allis-Chalmers-Bullock.

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John McDougall Caledonian Iron Works.
Peacock Bros.

Tramways—
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B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

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Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.

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C. L. Berger & Sons.
T. Eaton Co.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

Tube Mills—
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Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.

Turbines—
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Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.

Typewriters—
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Underwood Typewriter Co.

Vises—
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Washers—Gas—
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Water Gauges—
John Davis & Sons.

Water Wheels—
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John McDougall Caledonian Iron Works.
Jenckes Machine Co.

Wheels—
Mussens, Limited.
Jeffrey Mfg. Co.

Winding Engines—
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Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
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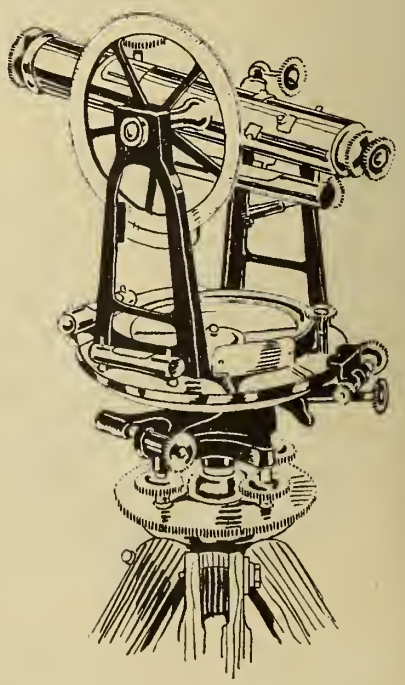
Universal Locating Transit



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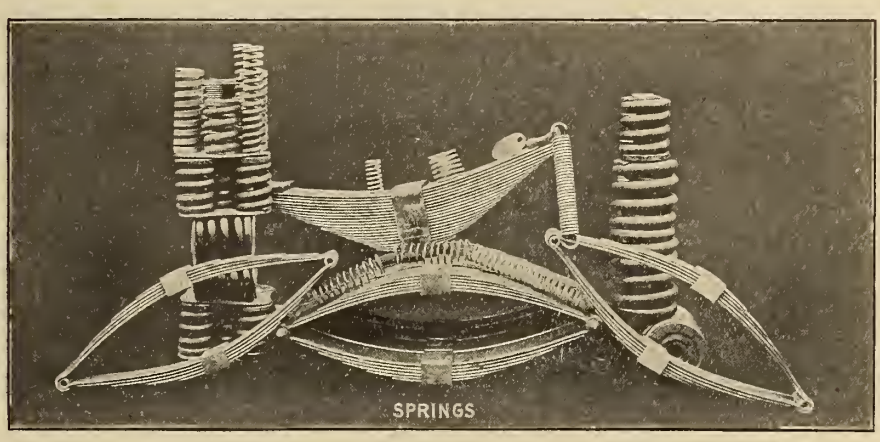
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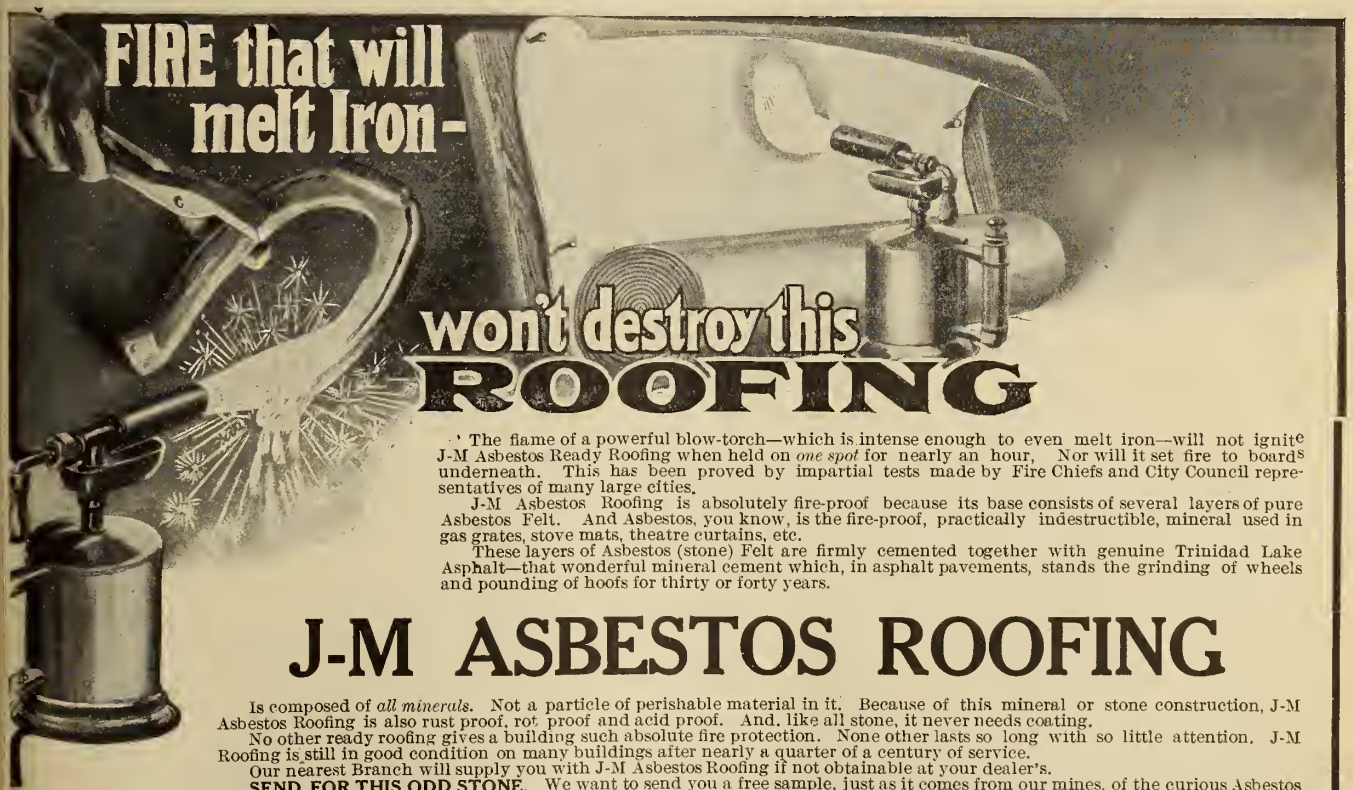

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1537

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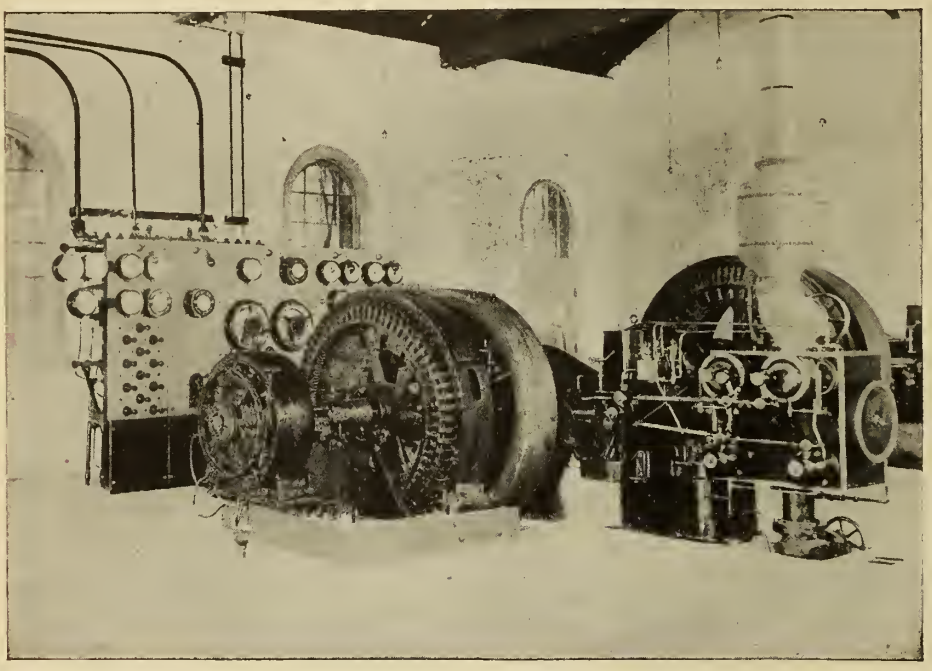
For Direct Mounting on Engine Shaft.



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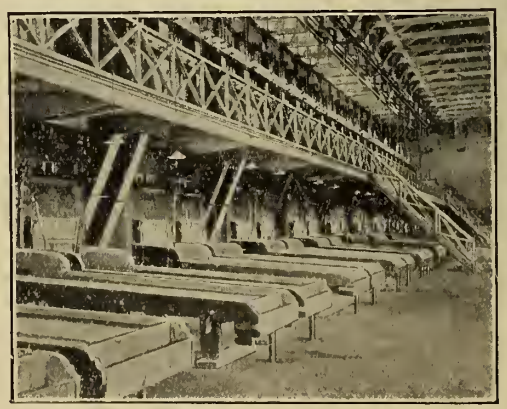

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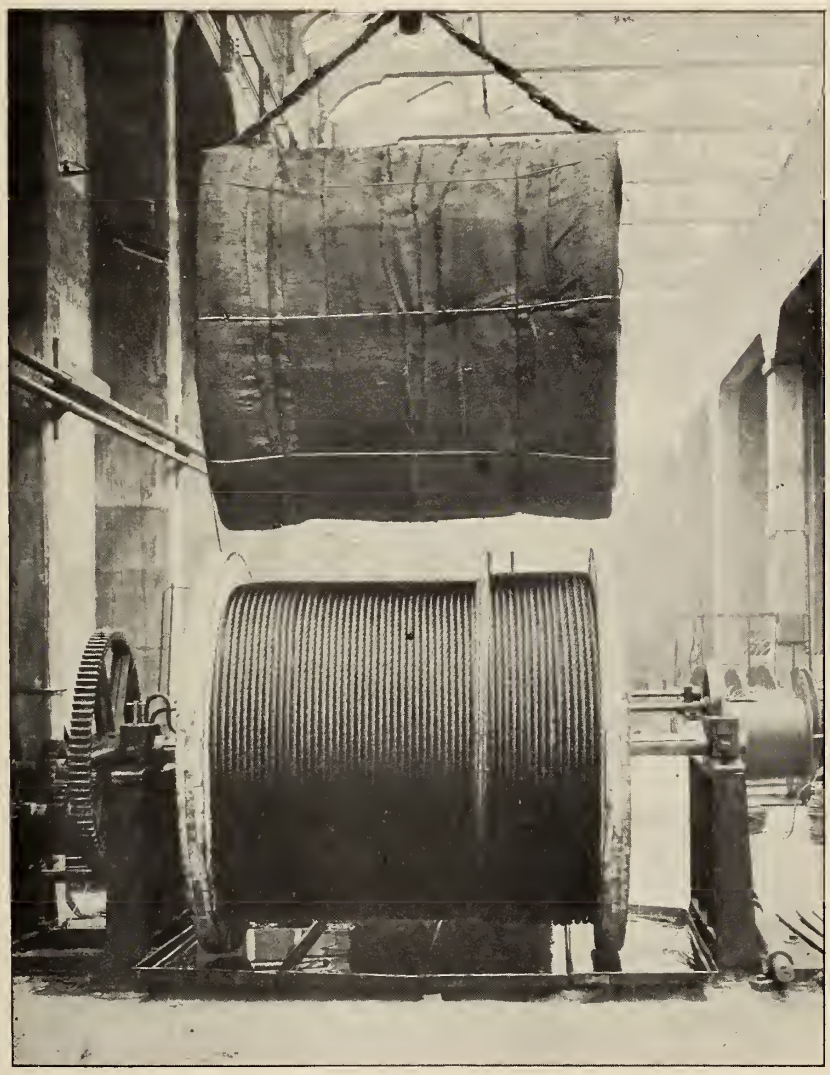

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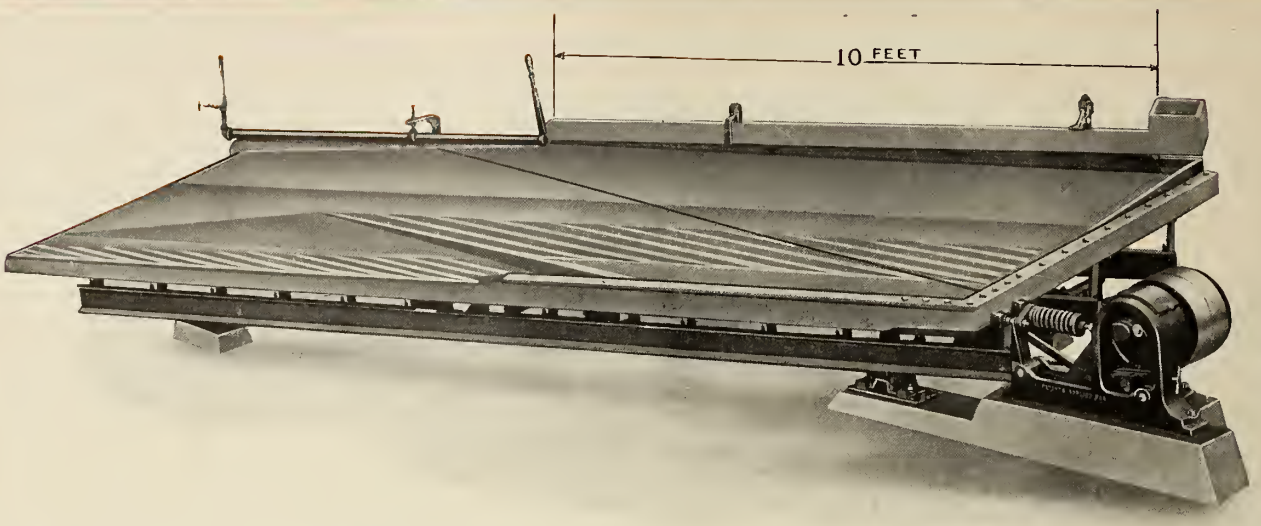

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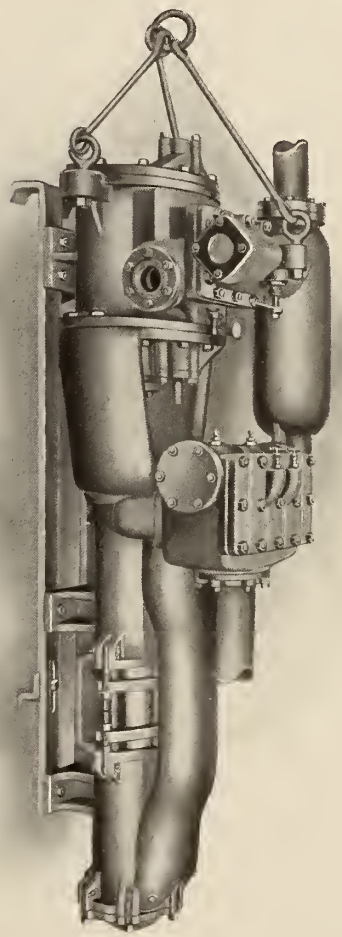

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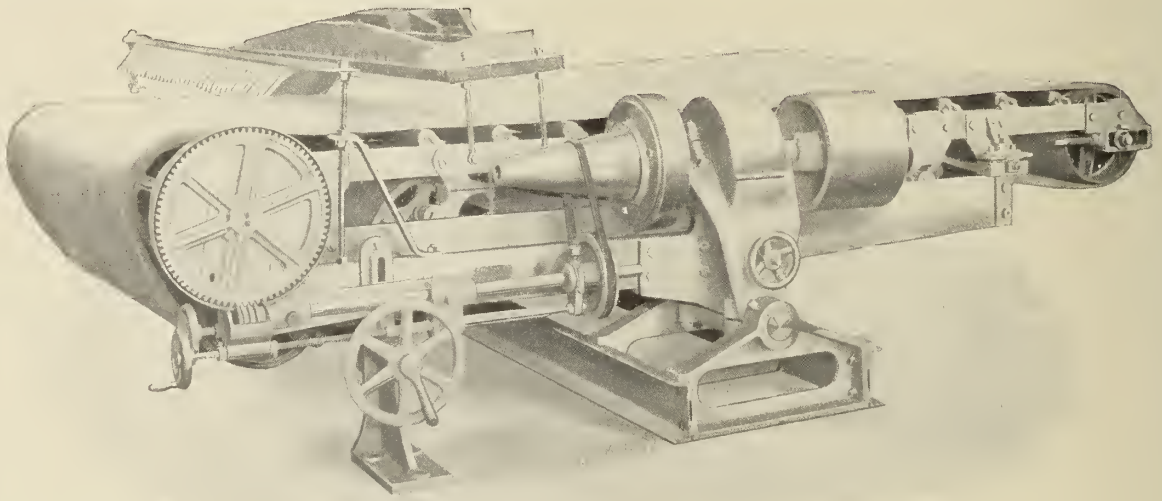

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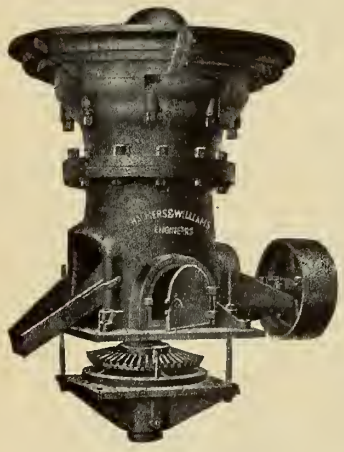

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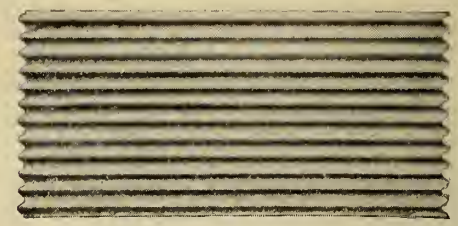

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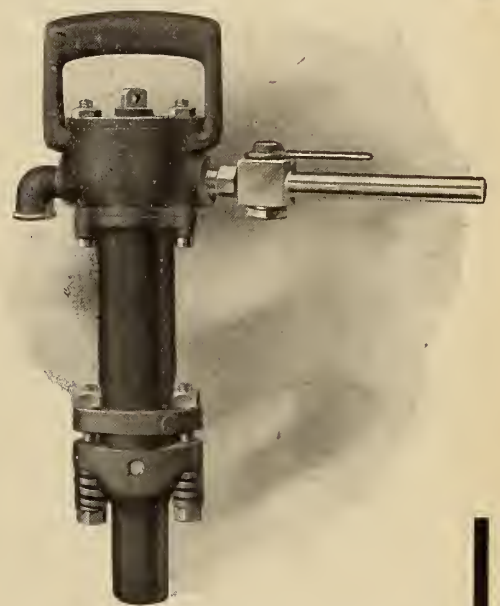

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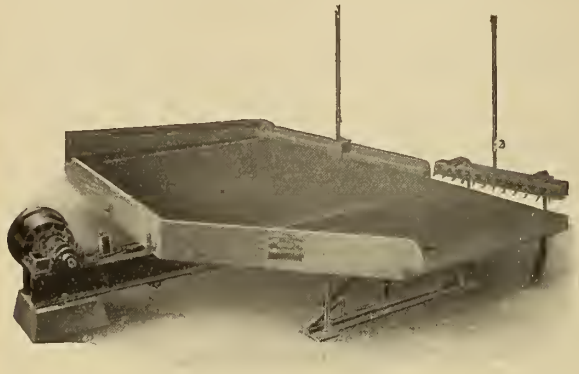

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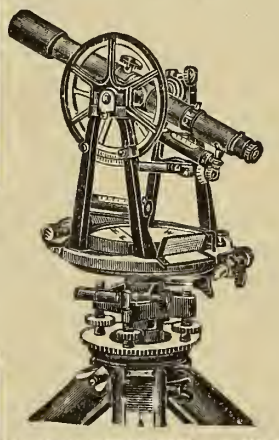

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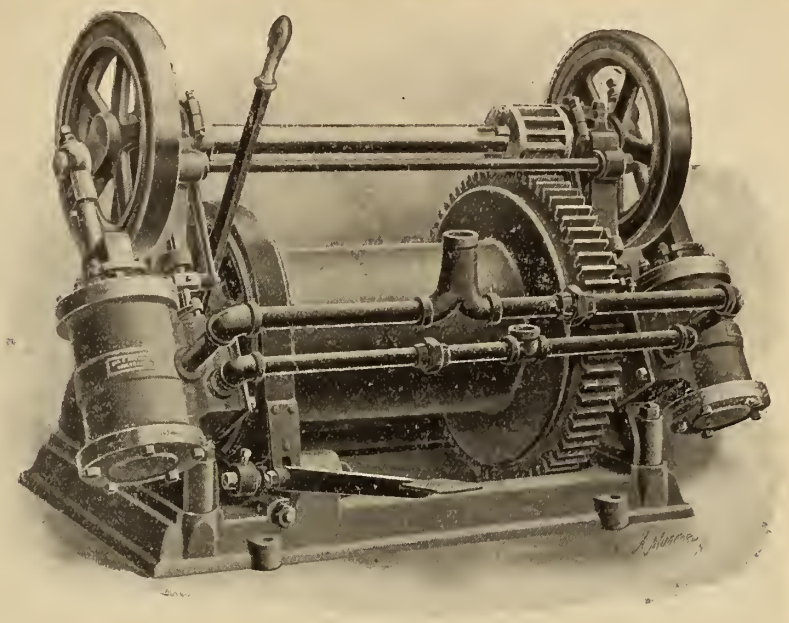

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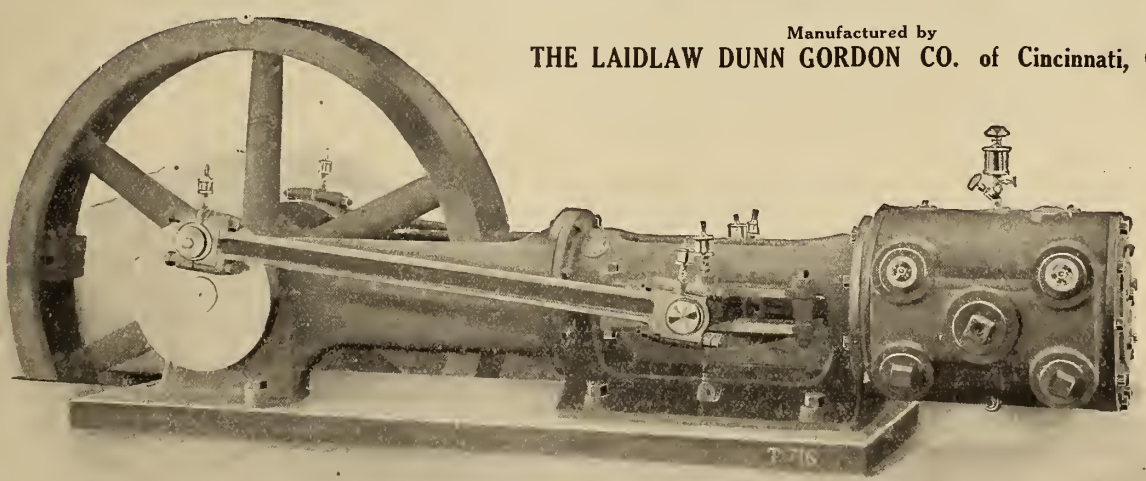

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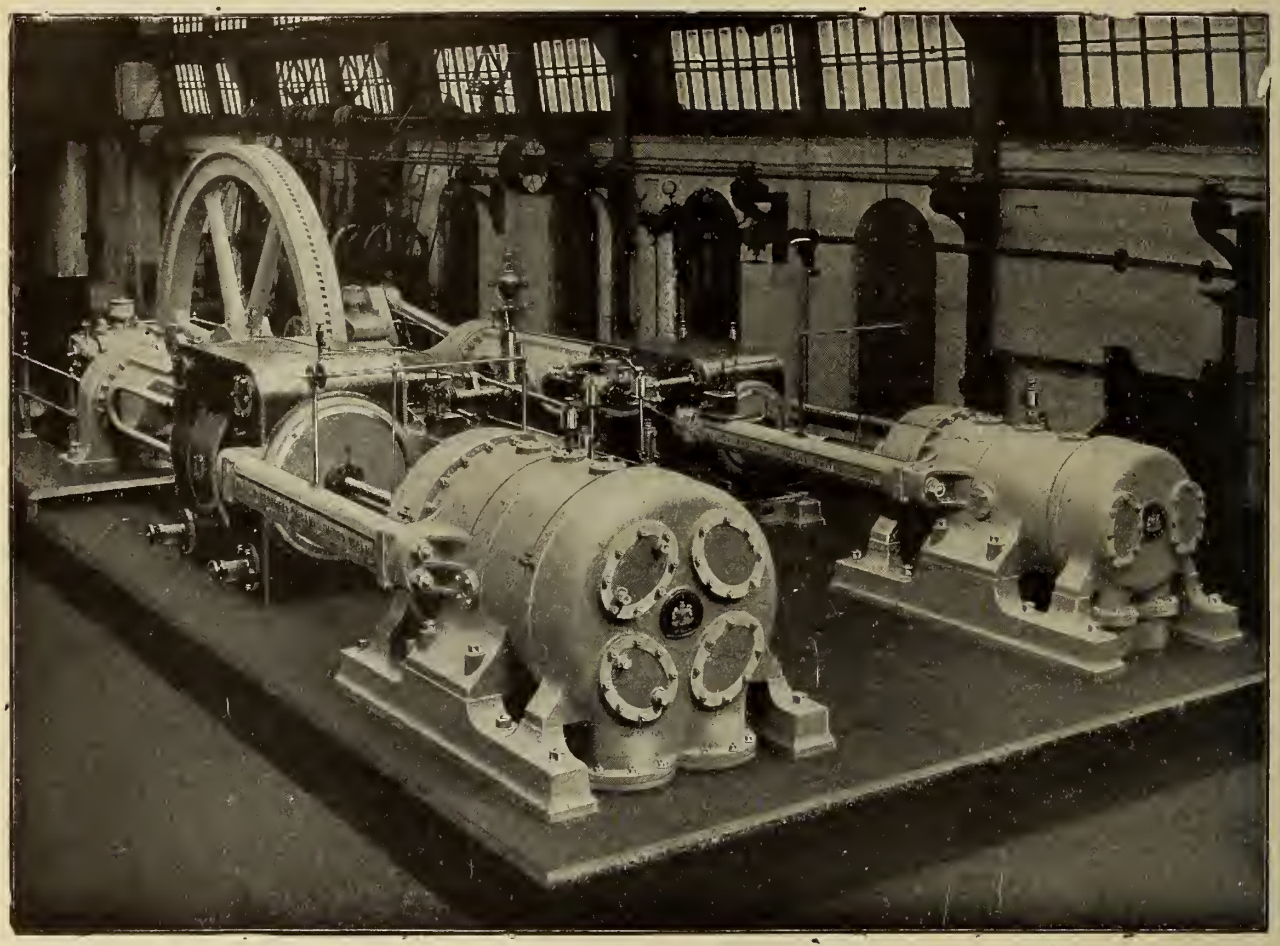

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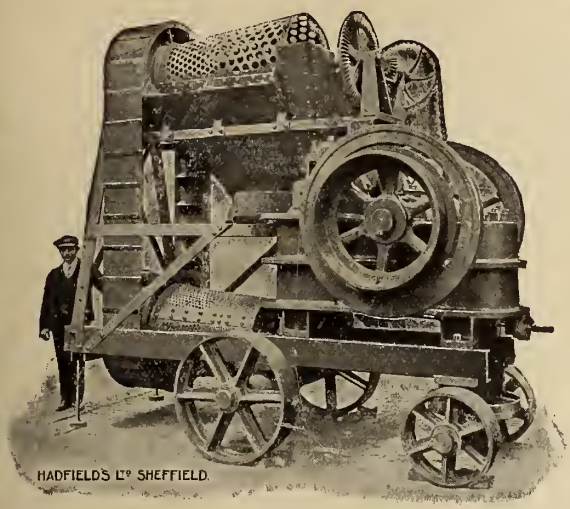

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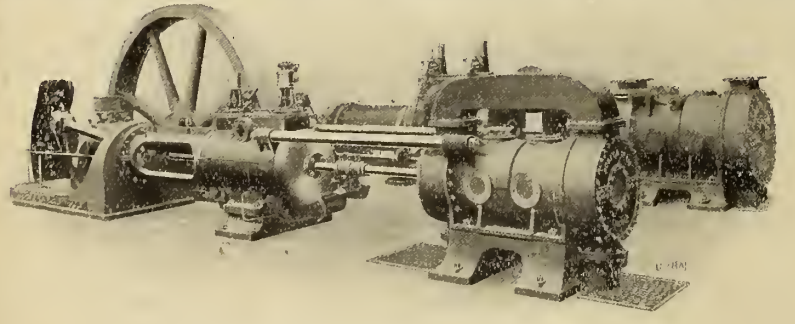

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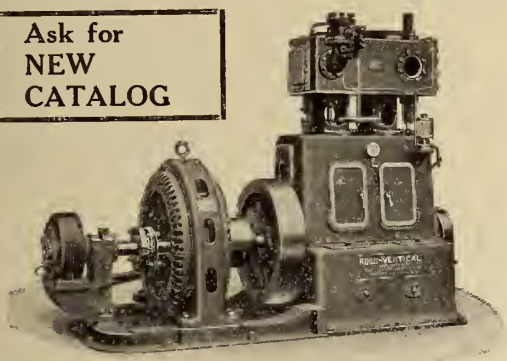

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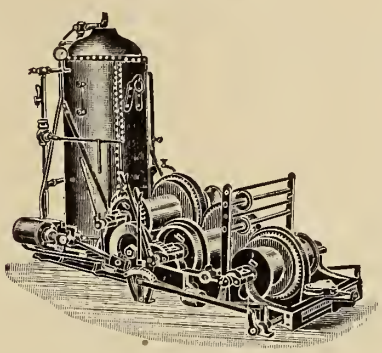

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A suit has been pending for some time against one of our competitors for direct infringement on our patents.

A decree was entered in our favour on January 5, 1912, in the District Court of the United States in the Southern District of Illinois at Springfield, which provides that a perpetual injunction issued out of and under the seal of the said Court, directed to the defendants, James Duncan, George D. Duncan, William N. Duncan, co-partners doing business under the firm name of Duncau Foundry & Machine Works, American Coal Washer Co., James Duncan and Lumaghi Coal Washer Co., and each of them and their officers, attorneys, etc., "enjoining and restraining them and each of them from directly or indirectly making or causing to be made, using or causing to be used, or vending to others to be used in any manner, any parts, machine, articles, devices, or apparatuses for and intended to be used for or in the construction of coal washeries or improvements granted by the said Letters Patent above referred to, or from infringing upon or violating said Letters Patent in any way whatsoever."

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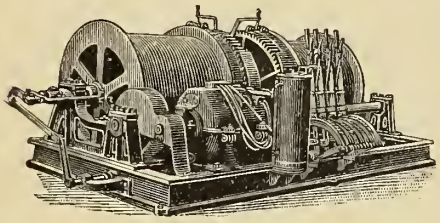

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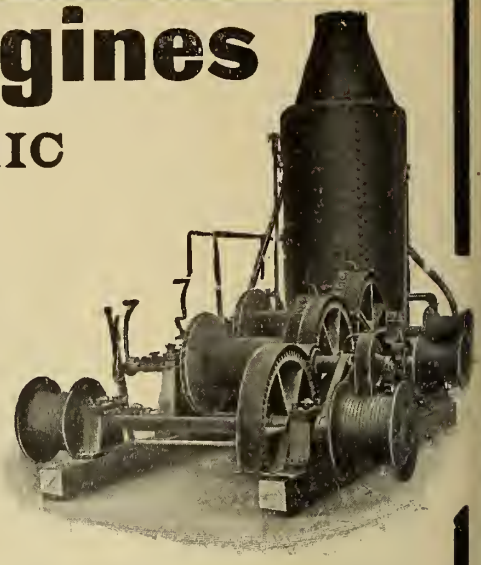

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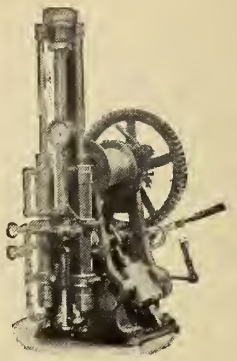

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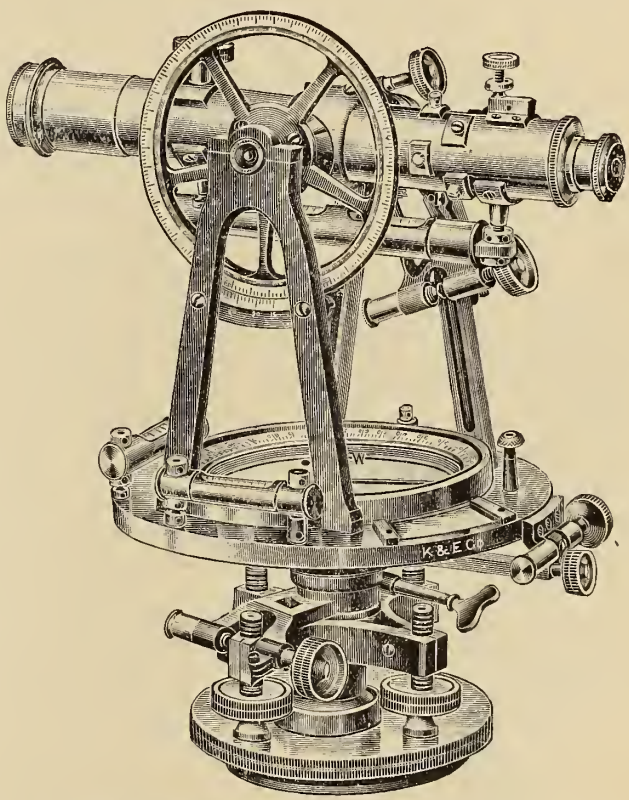

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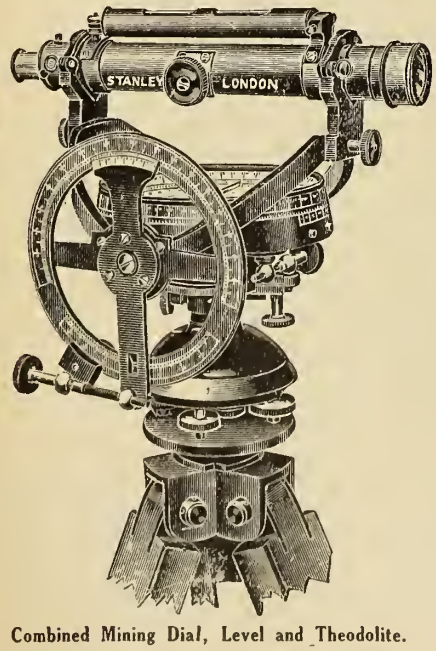

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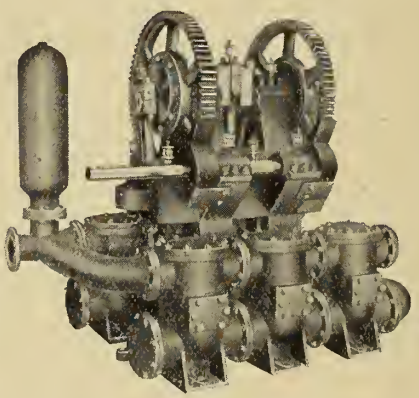

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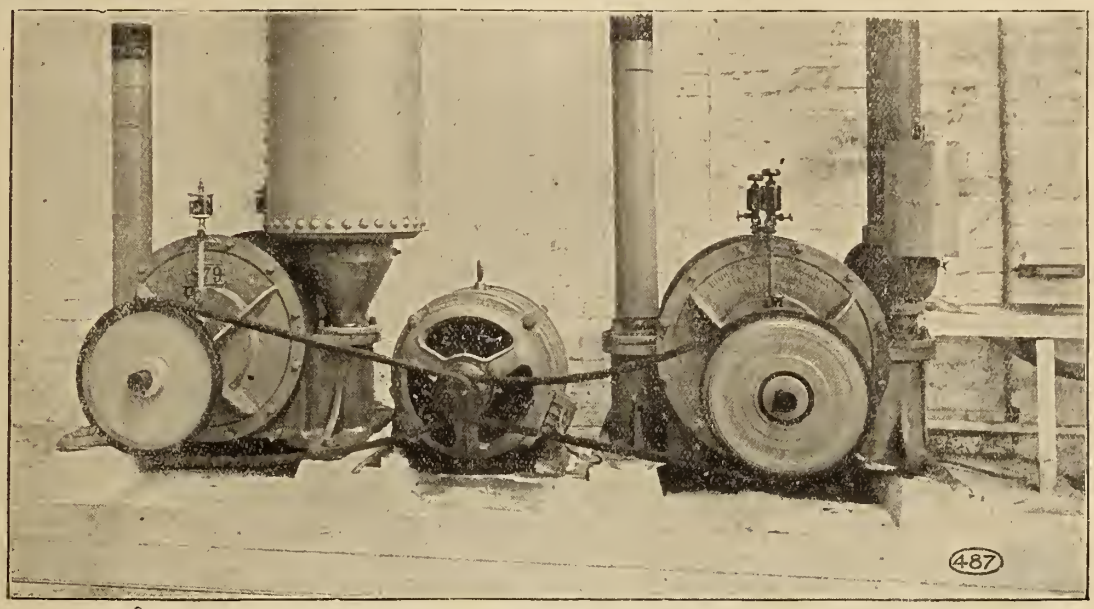

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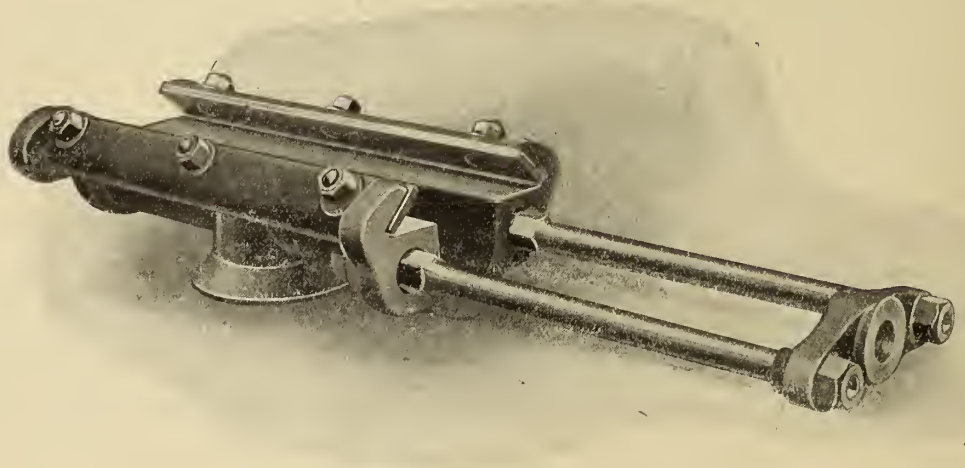

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, May 15, 1912. No. 10

The Canadian Mining Journal

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MINING AND WATER-POWERS OF NOVA SCOTIA

The exploitation of water-powers is one of the principal, if not the principal, factors in Canada's industrial development. Of British Columbia, Ontario, and Quebec this is particularly true. And of the whole Canadian mining industry it may be said that its growth corresponds roughly to the decreasing cost of power, and cheap power in mining regions is almost solely obtainable from our water-sheds.

The Canadian Commission of Conservation has issued no report more instructive than that entitled "Water-powers of Canada." From it have been gathered the facts on which this editorial is based.

According to estimates made in 1910, the total water-power developed in Canada for all purposes was equivalent to 1,016,521 h.p. The figures for each Province are:—

	H.P.
Ontario	532,266
Quebec	300,153
Nova Scotia	15,272
New Brunswick	9,765
Prince Edward Island	500
Manitoba	48,300
Saskatchewan	45
Alberta	7,300
British Columbia	100,920
Yukon	2,000
	1,016,521

This total is, of course, but a small proportion of the available power. Sufficient information is not yet secured to form a reliable basis for computing the undeveloped water-powers. One estimate, places them at 17,000,000 h.p. This, however, lacks authority. As regards the bearing of these powers upon mining, a brief glance at one Province will serve as a bird's-eye view of the subject.

Turning then to Nova Scotia, it may be stated without fear of contradiction, that there is scarcely a mine or a prospect (and here we are not considering coal mines) that is not within range of an adequate water-power. It is a fact that the pater-powers are relatively small. But they are abundantly able to meet any possible demands that are likely to be made on them for mining, and they are well distributed. The annual precipitation is large, and there are innumerable lakes to afford storage.

Along the coast of Nova Scotia, eastward from Halifax, there lies a large tract of gold-mining country. Such historic mines as the Dufferin, the Richard-

son, the Waverly group, and so on, are situated within a few miles of the shore of the Atlantic, while numerous other mines, most of them closed, are sprinkled through the districts inland. In this region there are scores of possible sites for power development. The low-water minimum horse-powers range from nominal figures to 1,100 h.p., the majority being over 100 h.p.

The mainland west of Halifax is even more bountifully supplied, there being well over 100 falls and chutes where, in each instance, from 100 h.p. to 4,000 h.p. can be guaranteed as a minimum.

When it is remembered that coal costs from $5 to $6 per ton delivered at many mining localities, that cordwood, of which the supply is none to plentiful, costs from $3 to $4 per cord, the advantages of hydro-electric power are easily discernible.

It has been mentioned that water-powers to the extent of about 15,000 h.p., have been developed in Nova Scotia. This total could be brought up to, say, 100,000 h.p. without undue outlay. The mining industry would utilize but part of this new source of power. Other industries, industries that the country needs, would participate most largely in the boon of cheap power. One does not need the vision of a prophet to imagine the growth that would follow the gradual placing at the disposal of the mining investor a reliable cheap and plentiful source of energy.

Some such idea has long been contemplated by the Nova Scotian Department of Mines, of course on a small scale. But it is an idea that the Provincial Government could well consider on the largest practicable scale. It is by no means an unrealizable dream. The example has already been set by Ontario.

AMENDMENTS TO THE YUKON PLACER MINING ACT.

Certain important amendments have been recently added to the Yukon Placer Mining Act. The full text of these amendments appears on another page. A brief summary of the changes is appropriate here.

The first amendment covers the performance of work by owners of adjoining claims. To any person or persons owning adjoining claims, not exceeding ten in number, the Mining Recorder may grant permission, for a term not exceeding five years, to perform on any one or more of the claims all the work required to entitle the owner or owners to a renewal grant for each claim held. Where, however, the application is made by more than one person, the applicants must file with the Recorder a deed of partnership creating a joint liability between the owners of the claims for the joint working thereof.

Similar permission may be granted for the working of more than ten placer claims, even when they are not contignous, providing the Gold Commissioner is satisfied that they are to be properly worked upon a large scale. This amendment probably gives too wide a discretionary power to the Commissioner. While right in principle, it is loosely worded.

Water and boundary disputes are to be submitted to a Board of Arbitrators. The arbitrators are to be selected by the parties to the dispute, or, failing that, the Commissioner is empowered to appoint them.

Damage or injury to claims by the dumping of refuse or by the drainage of water is specifically forbidden. In cases of dispute the Gold Commissioner is authorized to have the value and size of the dumping ground determined by arbitrators who will also fix a proper price to be paid for such ground.

ALEPH ANREP.

There appears in the Journal of the Canadian Peat Society, February, 1912, an appreciation of the late Aleph Anrep, who did more than any other individual to develop the European peat industry.

Anrep was born in Stockholm in the year 1845. At the age of 18 he graduated from Upsala University. While still a very young man he began investigating the problems that surround the manufacture of peat. During the period 1875-1880, he was employed by the Russian Iron and Steel Institute, and, amongst other duties, studied the German peat industry.

From 1881 till 1900, Anrep made Moscow his home. There, as expert for the Iron and Steel Institute, he constructed his first peat machine, and there he gradually improved his device in detail after detail. Two large factories, one near Moscow and one near Orel, turned out scores of the machines yearly. In the year 1901, there were more than 1,000 Anrep peat machine producing annually an aggregate of about 4,000,000 tons of air-dried peat fuel. Cotton and sugar manufacturers, foundries and private railways were then using the Anrep peat extensively.

But illness had overtaken Anrep in 1896. He found it impossible to prevent infringement upon his patents. His private fortune and a part of income were swept away. For five years he was confined to his bed. Not until the year 1900 was he able even to use a wheel-chair.

However, the Russian authorities were not slow to recognize the invaluable service that Anrep had rendered to the nation. In 1897, Alexander III. granted him a life pension. Three years ago the present Czar bestowed upon him another annuity.

Anrep died on December 29th, 1911. Seventeen years a helpless invalid, he never lost for a moment the fine enthusiasm that carried over difficulties that would have been considered insuperable obstacles by smaller men. His claim to fame is undisputed. Apart from the unquestionable merit of his inventions, he possessed an almost unique combination of qualities. He was not only an inventor, but a business man.

PROGRESS AT PORCUPINE.

We commend to the attention of our readers the letter of our special correspondent, Mr. Ben Hughes, wherein is summed up briefly the salient features of Porcupine's progress.

With only part of the Dome mill in commission, two gold bars, aggregating about 3,800 ounces, have been produced, while about 1,200 ounces have been sent out from the McIntyre mill.

At the latter mine, according to Mr. Hughes, there appears to be a probability that a large body of medium-grade ore will be put in sight by the end of the year. About 5,000 feet of work has been completed, and 15 drills are being employed.

Similarly cheerful news comes from the McEaneny, the Plenaurum, and other such mines.

It is evident that Porcupine is entering upon a quite new phase of existence. The actual production of gold from the stamp mills has not caused any sensational flurry. This is significant. In a camp that was not well-balanced, the appearance of substantial gold bars would have been the signal for all kinds of financial pyrotechnics.

House-cleaning is proceeding consistently in several of the companies that have showed signs of mismanagement.

In the main, it is safe to conclude that Porcupine has struck her pace and that the period of childish fevers is done with.

DETECTING CARBON MONOXIDE.

The use of birds or mice in detecting the presence of carbon monoxide in collieries is declared by Mr. George A. Burrell, of the United States Bureau of Mines, to be superior to any chemical tests. One-tenth of one per cent. of carbon monoxide in the air induces symptoms of distress in a man at rest in about two hours. A mouse becomes affected in ten minutes. Larger percentages of gas, say 0.6 per cent., prove fatal to mice and birds in two or three minutes; whereas a human being is apparently unaffected after breathing the mixture for ten minutes. Canaries, on the other hand, are even more susceptible than mice, and their symptoms are much more pronounced.

It may sometimes be the case that a mine atmosphere may be so deficient in oxygen that a lamp flame will be extinguished. But there may be no carbon monoxide present, nor may the absence of the normal percentage of oxygen affect either man or bird. In these cases the lack of any signs of distress on the part of the birds is proof that carbon monoxide is not present.

Mr. Burrell urges the more general use of canaries as indicators of poisonous atmospheres. By their use the element of personal error is removed.

HAILEYBURY CAPTURES THE PRIZE.

No more will long-distance justice be administered in the north. After a long and arduous campaign the citizens of Haileybury have succeeded in inducing the Ontario Government to make Haileybury the judicial centre of Temiscaming. The announcement was hilariously celebrated by loyal Haileyburians. Not only will the mining man be saved very serious expense, but the local real estate owner will be placed in a less insecure position.

A SUMMER'S CAMPAIGN.

Arrangements have been made and are now being carried into effect whereby special representatives of The Canadian Mining Journal will visit during the coming summer all the leading mining districts of Canada.

Thoroughly qualified writers are being engaged for suitable periods to gather material for special issues. While our plans are not yet complete, yet we feel that a preliminary word is not out of place.

It is our intention to cover not only the prosperous mining regions that are already in the public eye, but also to pay marked attention to those struggling districts that have not heretofore received sufficient advertisement.

That much good will result from this effort we are convinced. The possibilities of neglected fields and their immediate needs will be fully expounded. Much misapprehension as regards their mining history will be cleared away. And their claims will be brought fully and fairly before the public.

Naturally, the established camps will not be neglected. Carefully written articles on mining and milling practice, on transportation facilities and requirements, and, indeed, on every important phase of the industry, will appear.

Throughout the summer, then, The Canadian Mining Journal will collect and publish, in the form of special issues, copiously illustrated, a series of articles that will embody the latest news and views of the whole Canadian mining industry. In this effort we count upon the constant co-operation of Boards of Trade and other organizations. Particularly, also, do we desire suggestions from local mining men.

In all probability our first special issue will appear in June.

THE ELECTRIC FURNACE.

In this issue we publish a paper dealing with the electric furnace and its relation to steel. Our readers will notice that the English writer, Mr. Stedman, dwells particularly upon the manufacture of high-grade of special steels by the electric process, and predicts that, although this branch will remain for some time in the hands of the Sheffield crucible-steel maker, the suprem-

acy of the electric process is bound before long to be acknowledged.

The crucible process entails an expenditure, for melting alone, of from $15 to $17.50 in fuel per ton of steel produced. The original metal must be commercially pure. As a contrast, the electric furnace will melt and refine cheap scrap, and produce excellent tool steel, at a cost not exceeding $8 per ton.

The explanation of this very marked difference must be referred to other factors than prejudice and established custom. With all due respect to Mr. Stedman, whose facts we accept without demur, there must yet be some inherent defects to be overcome in the electric process. Otherwise a revolutionary change in the steel trade would be inevitable. Fortunately for all of us, change is a process.

However, it is written that the archaic crucible cannot hold its own any more than the "ordinary" bicycle, or the sailing vessel, or the hand-printed book.

It is not out of place to refer here to the Evans-Stansfield electric furnace, a Canadian invention, often mentioned in these columns. The experimental demonstrations with that furnace, producing the highest quality of tool steel, direct from titaniferous ores, have been uniformly successful. But prophets are without honour in their own country—otherwise we should all attain fame.

THE ALASKA-TREADWELL.

Running a 240-stamp mill for 30¼ days, and a 300-stamp mill for 19 days, the Alaska-Treadwell Company in March crushed 64,120 tons of ore. The total yield of gold was $160,000, or less than $2.50 per ton. The net profit was $64.000, practically $1 per ton. How many false hopes have been nurtured, and how many glittering prospectuses based upon the Alaska-Treadwell!

Several correspondents have asked us questions about this famous mine. To satisfy their legitimate curiosity, and to refresh the memory of others, we may repeat that Alaska-Treadwell mine is situated on Douglas Island, opposite Juneau, Alaska. The present company, whose capitalization is $5,000,000, was organized in 1890, since when regular dividends have been paid.

The ore bodies are irregular and enormous. The average gold content runs from about $2.15 to $3.15 per ton, and the total cost of extraction rarely exceeds $1.55 per ton. About 775,000 tons are milled during the year. The ore reserves in 1911, exceeded 6,500,000 tons.

These few facts give some vague idea of the size of the oft-quoted Alaska-Treadwell.

EDITORIAL NOTES.

The Mesaba range has yielded nearly 250,000,000 tons of iron ore during the last 20 years. Just 20 years ago, Mr. H. V. Winchell, then assistant State geologist of Minnesota, gave it as his opinion that ore of the newly-discovered range would average 60 per cent. metallic iron and would be largely within the Bessemer phosphorus limit. Last year's shipments fluctuated between 63.56 per cent. and 52 per cent. iron, the great majority being nearer 60 per cent. than 55 per cent. The phosphorus percentage is still almost uniformly within the Bessemer limit.

The annual average New York price of tin was 13.24 cents in the year 1896. With few downward fluctuations and irregularities the average price has gone up until the peak was reached in 1911, when the figure for the year was 42.68 cents. The highest price, for a short period, was reached in 1906, when tin sold for 50 cents. The lowest recorded price in the period 1896-1911, was marked in the year 1896. It was 12.62½ cents.

Vanadium is being produced in considerable quantities in Colorado. That State is beginning to rank as one of the world's chief sources of supply.

In a very thoughtful article in the May number of the Engineering Magazine, Prof. Frank P. McKibben compares "obstructive" and "constructive" conservation, and demonstrates the absurdity of restrictive legislation in respect to Alaskan coal lands. The article is a practical and sane presentation of the case for Alaska.

The new British Columbia forest fire regulations, promulgated by the Railway Commission, are looked upon as a decided menace to the coal mining industry. The matter is to be threshed out at Ottawa.

Our enterprising contemporary, The Colliery Guardian (London, England), has brought out under date April 17, a special Canadian issue in which appears an excellent account of the last meeting of the Canadian Mining Institute. Various official articles on Canada's coalfields are reprinted.

To put an air-lift pump in operation requires a greater air pressure than is necessary for ordinary working. In its own field, that of deep shaft pumping, the air-lift pump is most efficient. The action is nearly continuous, and the volume of discharge is limited only by the cost. Stoppages and breakdowns are unusual.

An enormous sum of money, roughly, $55,000,000, was spent in buying mining machinery and supplies for Rand mines last year. A comparison with Canadian expenditure would be interesting, but such a comparison is not now practicable on account of our imperfect statistics.

SOME RAND DEVELOPMENTS IN 1911.

The reports for the final quarter of 1911 of the properties in which the Rand Mines is interested have been issued. As these companies number ten, and their areas are distributed over quite two-thirds the length of the Rand—that is to say, from the Modder B on the east to the Bantjes Consolidated on the west—they may be said to be fairly representative of the whole.

Taking the companies in their order along the Rand from east to west, the Modder B first calls for notice. Development during the latter portion of the past year has been more or less a secondary consideration, the commencement of milling having demanded the preparation of the stopes for extraction of the ore. In spite of this, however, nearly 7,500 feet of main reef was disclosed, and averaged 26.6 dwts. over 12 inches, contrasting with 11,295 feet, assaying 32.7 dwts. over 11.83 inches. Compared by inch-dwts. the average for the latest period is 319.2, against 395. With respect to the neighbouring New Modderfontein, the position is as follows. During 1911 some 16,698 feet of reef was disclosed of an average value of 47 dwts. over 9.1 inches, as compared with 20,009 feet, averaging 60 dwts. over 8.5 inches for the preceding year. Tested by the inch-dwt the averages for 1911 and 1910 were 428 and 510 respectively.

Moving further westward, the Rose Deep has now to be dealt with. The reef disclosures during the past year represent a considerable improvement upon those of 1910, the better tendency continuing down to the close of the year. The greatest advance is in respect of the south reef. Of this gold carrier 3,187 feet were opened up, in contrast with 2,619 feet during 1910, and the average result was 9.3 dwts over 23 inches, as compared with 6.5 dwts over 19 inches; 4,079 feet of main reef leader was opened up, worth 11.7 dwts over 17.4 inches, in contrast with 3,169 feet, worth 9.3 dwts over 20 inches, but in regard to the main reef the result was not quite so satisfactory, 3,496 feet being disclosed for a value of 8.4 dwts over 24.3 inches, in contrast with 5,434 feet, value 8.4 dwts over 20 inches. The improvement in respect of the two first-mentioned reefs, however, more than counterbalances the shrinkage in width of the last. On the Village Deep, development work during the past year has been most successful. The actual footage of reef exposed—14,119 feet—is 1,430 feet below the total for 1910, but there is a great improvement in value. The main reef leader for the 8,202 feet exposed, assayed 16.0 dwts over 26.8 inches, as compared with 9.6 dwts over 32 inches; gauged by dwt-inches, the result for the former period is 408, against 307. As regards the south reef, the assay value was 13.1 dwts over 20 inches, as compared with 10.6 dwts over 26 inches.

In regard to the City Deep some leeway appears to have been made up. During 1910 the average assay value dropped from 24.27 dwts to 22.8 dwts and the width from 21.9 inches to 18.35 inches. The grade last year further shrunk, this time to 20.5 dwts, but the width was increased to 23 inches, which was sufficient to bring the inch-dwt average for the year up to 471½, in contrast with 418 in respect of 1910. In regard to the Crown Mines, upon which the enormous amount of 71,000 feet of work was performed, the values obtained during the year ruled lower; there has, however, been some compensation in the shape of improvement in width. In fact, the increased size of the main reef leader raised the inch-dwt, slightly above the 1910 figure of 401. In regard to the south reef, however, the expansion in width was insufficient to offset decline in grade, the ratio being 333 inch-dwts, in contrast with 384 inch-dwts. A favourable point is that the developments of the final quarter of the year were better than those of the three preceding periods.

On the Geldenhuis Deep results have been disappointing. This applies to all three reefs, but particularly to the two most important ore bodies. Reports show a drop of 3 dwts in the value and a shrinkage of 1 inch in the width of the leader, whilst the drop in the value of the south reef is 1.6 dwts and the shrinkage in the width 1.5 inch. Concerning the Ferreira Deep, work on the main reef leader during the year opened up ore of uniform but lower value. As to the south reef, despite considerable fluctuation, in the end the average for the year—namely, 21.1 dwts—is practically the same as for the preceding period, while there was a small increase in width. The Nourse Mines has not done so well, the grade of both the main reef leader and south reef, while fluctuating, being lower on balance. There was a little compensation in higher values in the main reef disclosed, although this was accompanied by shrinkage in width. With regard to the Durban Roodepoort Deep, the feature is the much greater amount of work performed on the main reef, 5,332 feet of reef being disclosed, against 2,172 feet; the net result was, however, rather disappointing, the value being 12 dwts over 26 inches, in contrast with 13.2 dwts over the same width. In regard to the south reef little change is shown, the assay value being 33.6 dwts over 10.9 inches, in contrast with 36.7 dwts over 10 inches, the inch-dwt for the latest period being 366, as against 367 inch dwts. On the Bantjes Consolidated work has been practically confined to the south reef, and nothing like the same amount of reef was exposed, the total being 7,440 feet, against 14,955 feet. The width at 11.3 inches represents a decline of 3.7 inches, but the value rose from 18.7 dwts to 20.7 dwts.

ROCK-DRILL DUST COLLECTOR.

Two mechanics in the employ of the De Beers Consolidated Mines have invented and patented a device for collecting the dust produced by rock drilling and preventing its diffusion into the atmosphere. According to the "South African Mining Journal," the contrivance has been tried at De Beers under working conditions, and has answered the tests. "The apparatus consists chiefly of a steel casing, small in diameter and cylindrical in form and weighing about 5 lbs. This is meant to surround the drill at the working face. It opens in two—the halves being connected by hinges—so that the drill may easily be changed or adjusted. Each half of the casing has a dust collecting chamber, which can be fitted either with a lid or a removable bag. The device can, therefore, be used no matter what may be the angle at which the drill is being worked. Running round the front of the casing is a groove into which rubber is fitted for the purpose of pressing against the rock face, and thus preventing any escape of dust between the rock and the casing. In consequence of this, the dust, it is claimed, passes back into the cylinder and falls into the dust collecting chamber. The casing is supported on telescopic piping, which is fastened to the cradle of the drilling machine by means of a clamp. The outer piping is perforated, so that by the use of a pin the inner tubing can be adjusted to the length of the drill in operation."

PERSONAL AND GENERAL

Mr. J. B. Woodworth, mining engineer, Lyndhurst avenue, Toronto, has returned from a professional visit to Arizona.

Mr. S. N. Graham, mining engineer, a gratuate of Kingston School of Mining, who has had experience both in Mexico and Canada, is taking an office in Toronto. His temporary address is in care of the Canadian Mining Journal.

Toronto, March 9.

Mr. W. J. Loring, of Messrs. Bewick, Moreing & Co., visited California in March in connection with the development of the Plymouth Consolidated Mine.

Colonel John Carson and Mr. Samuel W. Cohen, president and general manager, respectively, of the Crown Reserve Mining Company, Limited, Cobalt, have gone to Europe for two months on business for the company.

Mr. W. E. Duncan, consulting engineer, formerly of Merritt, B.C., has removed his office to Vancouver, where he proposes to undertake mining engineering work.

Mr. C. F. J. Galloway, consulting mining engineer, Vancouver, B.C., who contributes an article to this number of The Journal, is a son of Professor W. Galloway, of Cardiff, Wales.

Mr. John Hays Hammond has sailed for Europe.

Mr. Ellis Thomson, a graduate in science of Toronto University, and of Freiberg, will accompany Mr. J. B. Tyrrell during the coming summer on the Ontario-Manitoba Boundary Expedition.

Mr. Walter Henry Weed announces that the firm of Weed & Probert has been dissolved by mutual consent. Mr. Weed has taken offices at 42 Broadway, New York, where he will continue in practice as consulting engineer and mining geologist.

The Roberts & Schaefer Company, Chicago, consulting engineers and contractors for coal washeries, etc., have moved to new offices on the top floor of the McCormick Building.

Mr. Clifford E. Smith, mining engineer, Brockville, is to make Toronto his headquarters hereafter.

Mr. Edward G. Warren, acting general manager of the British Columbia Copper Company, has returned to Greenwood, Boundary district, B.C., from a business visit to St. Paul, Minn.

Mr. Lorne A. Campbell, formerly of Rossland, B.C., manager of the West Kootenay Power and Light Company, is on a visit to Great Britain. At the recent provincial elections Mr. Campbell was elected to represent Rossland district in the Legislative Assembly of British Columbia. It is stated he intends building a residence in Victoria and removing to that city.

Mr. W. Gus Smith, of Corbin, Crow's Nest district, British Columbia, has returned to Southeast Kootenay, where he has for years been resident engineer for the Corbin Coal and Coke Company, operating a coal mine in that district. During his temporary absence he visited a number of coal mines in the United States.

Mr. John Kiddie, elder son of Mr. Thomas Kiddie, of Vancouver, a matallurgist well known in British Columbia, Southeast Alaska, and the State of Washington, has been appointed assistant superintendent at the Arizona Copper Company's mines at Morenci, Arizona, where for some time he has been the company's geologist and mining engineer.

Mr. Fred. M. Wells, of Vancouver, B.C., recently returned from that city to Surf Inlet, Princess Royal Island, where he is supervising the development of a gold mine for the Surf Inlet Gold Mines, Ltd. The outlook for this enterprise is stated to be promising.

Mr. H. E. Croasdaile, formerly of Nelson, B.C., where for some time he was general manager for the British company that then owned and operated the Silver King mine and smeltery, is reported to intend to shortly return to the Nelson district to reside, after having been in England for several years.

Mr. Alexander Sharp will spend the ensuing summer at Mr. P. Burns' coal mines in Alberta, where development work will be continued. At present Mr. Sharp makes Vancouver, B.C., his headquarters.

Mr. Robert R. Hedley, of Vancouver, B.C., manager of the Canadian Mining Operators, Limited, of that city, has been appointed president, pro tem., of the Vancouver Mining Club, recently organized there. Those present at the meeting for organization, which was presided over by the Mayor of Vancouver, were "very optimistic regarding the mineral resources of British Columbia."

WORLD'S PRODUCT OF TUNGSTEN ORE.

(Quantities in tons of 2,000 pounds.)

	1910	1909
South Africa	...	16
Federated Malay States	105	99
French-Indo China	19	...
British India	23	7
New South Wales	413	431
Northern Territory	78	49
Queensland	1,145	679
Tasmania	75	20
Victoria	31	15
Western Australia	47	6
Dutch East Indies, Billiton	21	12
Dutch East Indies, Singkep	12	12
Austro-Hungary	54	43
Great Britain	307	421
France	...	55
Germany (Saxony)	105	106
Portugal	1,132	609
Spain	...	142
New Zealand	187	78
Nova Scotia	83	...
United States	1,821	1,619
Argentina	1,061	900
Bolivia	232	168
Other countries	549	513
Totals	7,500	6,000

MINING COSTS.

The several factors which make for low mining costs are width of the ore body, the free milling nature of the ore, extraction of the ore by means of adits and freedom from the cost of pumping water. If, in addition to the above-mentioned favourable factors, there were abundant water-power available for all the requiments of the operations, then costs would be reduced to a very low level, especially when operations were carried out upon a large scale. It is the presence or absence of these factors which make it so difficult to compare the costs of one mine with another.

YUKON MINING LEGISLATION

Bill No. 181.

An Act to amend the Yukon Placer Mining Act.

(Assented to 1st April, 1912.)

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. Section 22 of chapter 77 of the statutes of 1908 is repealed and the following is enacted as section 51 of the Yukon Placer Mining Act, chapter 64 of the Revised Statutes, 1906, hereinafter called "the principal Act":—

"51. Upon application being made to him by any person or persons owning adjoining claims not exceeding ten in number, the Mining Recorder may grant permission, for a term not exceeding five years, to any such person or persons to perform on any one or more of such claims all the work required to entitle him or them to a renewal grant for each claim so held by him or them: Provided that, where the application is made by more than one person, the applicants shall file with the Mining Recorder a deed of partnership creating a joint liability between the owners of the claims for the joint working thereof.

"2. If, however, application is made for permission to include in one group more than ten placer mining claims owned by one individual, company or group of individuals included in a registered partnership, and if upon the report of the Mining Inspector it is shown to the satisfaction of the Gold Commissioner that such claims are to be operated by a system of mining on a large scale, which has a direct bearing upon all of the claims affected, and renders a considerable area necessary to successful operation by the system proposed, the permission provided for by this section may be granted for a period of not more than five years, with the approval of the Commissioner, with respect to such claims, notwithstanding that they are more than ten in number and not all contiguous; such permission, however, to be subject to cancellation at any time by the Gold Commissioner, after sixty days' notice to the persons interested, in case it appears from the evidence contained in the application for the renewal of the claims affected, or from the report of the Mining Inspector, that the system of mining contemplated when the permission to group was granted is not being installed or operated with reasonable diligence."

2. Section 74 of the principal Act, and section 29 of the statutes of 1908, are repealed and the following is enacted as section 74 of the principal Act:—

"74. In the event of any dispute between owners of claims or lessees of locations with respect to the distribution of water or the boundaries of claims or to dumping or any other matter referred to in the next following section, such dispute may be heard and determined by a board of arbitrators to be appointed as follows: The Gold Commissioner, upon the request of any such owner or lessee for the appointment of a board of arbitrators and upon being furnished with a statement of the matter complained of clearly expressed in writing, shall notify each owner and lessee specified in such request to appoint an arbitrator, and in case such owner or lessee refuses or neglects to appoint an arbitrator within thirty days from the date of such notification the Gold Commissioner, upon being requested so to do by the arbitrator or arbitrators appointed, or by any interested owner or lessee, shall appoint such arbitrator or arbitrators. In the event of the total number of arbitrators so appointed being an even number, an additional arbitrator shall be appointed by such arbitrators.

"2. In the event of the arbitrators so appointed being an even number, and being unable to agree upon the additional arbitrator, or failing to do so within five days from the date upon which the last arbitrator was appointed, the Gold Commissioner, upon being requested so to do by the arbitrators so appointed or by any interested owner or lessee, shall appoint the additional arbitrator.

"3. The arbitrators shall be entitled to be paid a per diem allowance of ten dollars, together with necessary travelling and living expenses, while actually engaged in the arbitration, and the costs of such arbitration, including the cost of any examination of the property which may be found necessary, shall be borne by such owners or lessees as are parties to the dispute, and in the proportion set out in the award of the arbitrators.

"4. The procedure in all cases before a board of arbitrators under this Act shall be in accordance with rules prepared by the Gold Commissioner and approved by the Commissioner."

3. Section 75 of the principal Act is repealed and the following is substituted therefor:—

"75. Except as hereinafter provided, no person mining upon any claim shall cause damage or injury to the holder of any claim other than his own by throwing earth, clay, stones or other material upon such other claim, or by causing or allowing water which may be pumped or bailed or may flow from his own claim, to flow into or upon such other claim.

"2. If the owner of a claim wishes to deposit the leavings, deads, waste or tailings therefrom on any adjacent claim, or on any other adjacent mining property, whether the same was acquired under the provisions of this Act or any other Act, order in council or regulation governing mining in the Yukon Territory, which claim or mining property is of not less than five years' standing, or if such owner wishes to cause or allow water which may be pumped or bailed or may flow from his own claim to flow into or upon such other claim or mining property, he may give one month's notice of such desire in writing to the owner or lessee of such adjacent claim or property, and if, at the expiration of the month the owner giving the said notice and the owner or lessee of the said adjacent claim or mining property has not been able to arrive at an agreement as to the price to be paid for the dumping ground or for damages caused by such flow of water, the owner giving notice may apply to the Gold Commissioner to have the value and size of the dumping ground determined by the said board of arbitrators, and the said board shall have power to permit so much of the said adjacent claim or property to be used for dumping and at such a price as the said board of arbitrators deems just."

FROM THE FORTHCOMING ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES BUREAU OF MINES, FOR THE FISCAL YEAR ENDING JUNE 30, 1911.

Explosives Used in Coal Mines.

During the year a number of explosives have been thoroughly tested and have been designated as "permissible" explosives for use in dusty and gaseous mines under the conditions prescribed by the bureau. These "permissible" explosives give a short, quick, and relatively cool flame that is less likely to ignite inflammable gas or coal dust than is the flame of dynamite or that of black powder. Up to July 1, 1911, 88 explosives had passed the tests required by the bureau and had been placed on its list of permissible explosives.

In its endeavour to reduce the dangers attending the use of explosives in coal mining the bureau is meeting with the heartiest co-operation of manufacturers of explosives, who are steadily endeavouring to produce new explosives that will meet the increasing rigid demands the bureau makes in behalf of safety. So many requests have been received for tests of these new explosives that the testing work is now nearly a year in arrears. But although the bureau is anxious to test these explosives promptly, in the belief that they may be superior to those already tested, it is unable to bring the work up to date without increasing the force of engineers and chemists engaged in making these tests, and the funds available for conducting the investigations are not sufficient to meet such increase. In testing and analyzing the explosives examined during the year nearly 10,000 tests, analyses, and determinations were made.

The chemical investigations, like the physical tests, of explosives, have been carried on at the Pittsburg station of the bureau. In addition to routine chemical analyses and tests, several improved methods of testing have been devised.

A FEW REMARKS ON SOME OF THE GOLD DEPOSITS OF ONTARIO

F. Hille, M. E.*

The Canadian people present the characteristic that they can be stampeded politically, economically, and otherwise with the greatest ease from one extreme to another, that one day they can be led to anticipate harvesting fortunes from a certain enterprise, be it a mine or newly discovered mineral region, and the next are frightened into a panic, imagining that they either have lost or might lose all that had been put in. To-day they are booming with the most enticing songs a gold discovery; to-morrow they are deep in the dumps, bewailing a few dollars foolishly spent.

Knowing these characteristics, persons who try to pose as advisers to the public should be slow in arousing it from slumber. Therefore, mining booms should proceed by natural growth, or should only be permitted when they are justified. On our continent, however, they seem to be a necessity, in order to awaken the public to the fact that a mineral industry is not only necessary, but that it is as legitimate, and, when rightly undertaken and conducted, as remunerative as any other industry.

However, if we have a mining boom, and there is some justification for it, let us not disturb it without warrant. Scare-crowing, for whatever motive done, will neither benefit the camp, as long as it is not sufficiently developed, nor will it benefit the investor, as long as it cannot be proved that his money is being sunk in an illegitimate scheme. I have seen prospective investors frightened away from mines and mineral prospects which turned out later to be highly remunerative enterprises. Let the public learn that it is advisable, if it desires to make money out of any undertaking, either to understand something about it, or to take experts' advice on the subject. To argue that it is humanitarian to save people from squandering their money and to guard the camp from getting a bad reputation, is a mistaken idea. The quicker the public learns the A.B.C. of industrial pursuits the better for it. Do not try to teach babes to walk with a "walking chair"; let them find their equilibrium in a natural way.

In reading the copious advice given to the public by newspapers, mineral land owners, by learned and non-learned professors, since the Porcupine gold fields were discovered, I was astonished to find so great an amount of innocence and ignorance displayed by most of the writers or speakers, especially in their critiques on the gold deposits of this province in general, throwing, as they do, the numerous gold camps into one pot and from that serving up a hash, the result being an absolutely indigestible product, which is dished up to the poor, unsophisticated public. For instance, in what relation does the Porcupine camp stand to the Madoc, the Island Falls to the Manitou, or the Sturgeon Lake to the Lake of the Woods or Rainy Lake? What good purpose does it serve to make public utterance to the effect that "none of these localities is of promise," yes, "that they were absolutely disappointing," when such assertions are entirely wide of the mark?

The mania for going before the public with a subject insufficiently digested, merely for the purpose of either posing as a humanitarian, or parading in an expert capacity, shows neither a sound spirit of benevolence nor a sufficient knowledge of professional ethics of professionalism, and it will commonly, as a logical sequence, produce just the opposite of the effect desired.

The only reasonable article dealing with the Porcupine that I have read lately is one by Ingalls, in a recent number of the Engineering and Mining Journal, in which the writer neither condemns nor exaggerates, but gives credit where credit belongs.

Porcupine is still wearing its first baby shoes, and will wear them for some time to come. Why, then, treat it like a full-grown individual, and allow cobblers to descend on it with all kinds of boots, fashioned in a manner altogether ridiculous? Only thoughtless critics will claim that among the thousands of claims

*Mining Engineer and Chemist, Port Arthur, Ont.

taken up in that country, "it would be questionable whether there would be more than one or two mines produced from them," and point sarcastically at that other, older gold mining camp in Western Ontario. Let me inform my readers that these people do not know what they are talking about, because, for the development of a mining camp, there is needed time, money, knowledge, skill, perseverance and honesty.

The Porcupine camp has not yet had time to show its full possibilities. Let us examine it again in three or four years, and, if in that time it has been thoroughly proved, we will be better able to sit in judgment. What has so far been done and been shown up speaks well for its future.

Now, as to the older gold-mining camps in Ontario, in particular those in the Thunder Bay and Rainy River Districts, I would class them as being just as promising as the newer camp. I might even venture to say that neither Porcupine nor any other locality has produced anything that would equal in richness and extent some of the mines in the Rainy River District. I have in mind particularly one mine which is really phenomenal, while a large number of the gold deposits which exist here, will hold their own with those of any other gold-producing area on the continent.

The failure of these camps to produce flourishing mines would be easily understood by those who wish to follow the history of gold mining here, if they had witnessed the amount of ignorance dumped into these camps, had seen how mines and prospects were used as milking cows by owners and promoters, who sold shares and pocketed the proceeds, instead of putting it into the mine, and had noted what kind of persons acted as managers and superintendents, men who had no more knowledge of the business they were supposed to be conducting than the man in our satellite, and, last, but not least, had seen men reporting favourably on prospects which did not deserve the name of "deposit" or "vein," while others again were reporting unfavourably, notwithstanding the fact that they were treading upon free gold sticking out of the quartz which represented the filling of the finest and truest fissure vein that one could wish to see. Even yet I lately read an official report in which it was claimed that in a certain district the fillings of the veins—gold, pyrites, quartz and everything else—were derived from the country rock by lateral segregation. This one assertion, if true, would condemn the entire district, but, fortunately, nature has been kinder to mankind than was admitted by the writer's knowledge of economic geology.

Picture a vein, deposited in a fault-fissure, with a surface outcrop eight feet in width and gradually widening out towards depth, until, at the present lowest level, now at 500 feet, it attained a width of 25 feet, assaying, with some heavy visible gold streaks, several hundred dollars, and without these stringers, nearly $16 on an average, which for nearly 200 vertical feet, has produced lumps and nuggets of gold, sometimes three inches in diameter, imbedded in a quartz gangue well-defined throughout a zone of sheared altered schist!

It would lead me too far, were I to try and give here a comprehensive account of the various gold deposits occurring in our two districts. Only this I may say, that the greater number of them are situated in fault-fissures, in sheared zones of different rocks, some in discission—and others in contact-fissures.

The ores are usually of very simple composition, either free-milling or partly so, in the latter being suphides, of which iron pyrites predominates, of other minerals we occasionally find galena, blende and pyrrhotite, rarely, however, in large quantities. In two instances only have I found gold combined with tellurium, otherwise the treatment of our ores offers no difficulty.

When any individual possessed of intimate knowledge of every feature of our ore deposits has to read statements made by people who either have no personal knowledge or only the most casual acquaintance with them, and has to observe how injustice is thereby done first, to our mineral industry; second, to the localities, third, to the province, and, fourth, to the owners, is it to be wondered at that he should resent such imprudent utterances?

There cannot be the slightest doubt that, in a few years, we will see mines opened up and profitably worked in a number of localities; this, however, will only be possible when people have learned more about the nature of our ore deposits, how to open them, how to win the ores and how to treat them, and when they have also learned the further lesson that, for the making of a mine, money is needed as well as knowledge, patience as well as right judgment, constant attention as well as honesty.

SPECIAL CORRESPONDENCE FROM QUEBEC.
THETFORD MINES, QUEBEC.

May 3, 1912.

The past winter has been one of the quietest in the history of the asbestos industry. Broughton and Robertson and their seven mines were idle. Black Lake, with its population of 5,000, had its working force reduced to 30 men; while Thetford itself was enlivened only by the activities of the Bell, Jacobs, and Johnson Companies, and the greatly reduced forces of the Amalgamated. This is a sorry experience for such an industry—an industry whose healthy growth has been paralysed in order that a few capitalists and promoters might advance their personal schemes.

It can only be sincerely hoped that those who depend upon the asbestos industry for a living will in the future be ready to protest against any combination of interests that openly threatens its stability. There was no just reason for the organization of the Amalgamated, as there is not a mining industry in America to-day where conditions are more favourable for the building up of an increasingly profitable trade, giving steady employment to labour. Had the industry not been tampered with, the condition of labour would have been immensely improved, and the asbestos securities themselves would have been as valuable as those of our best railways.

At Thetford the new Martin-Bennett mine is in full operation and employing about 200 men. All the other mines are increasing their operations to the usual summer scale.

At Robertson the Berlin and B. & A. mines are resuming operations, and it is expected that their mills will start operations shortly.

In addition to the development of placer mining in Beauce, which was carried on last year and will be again this summer, Mr. Walter Raleigh Kerr has secured mining rights on 1,800 acres of gold-bearing quartz and placer property about fifteen miles from Sherbrooke on the Quebec Central Railway. Here he

intends to prospect thoroughly this summer. Mr. Kerr, it is stated, has ample financial backing from Montreal and will thoroughly investigate the value of the showings. Work done last autumn gave some satisfactory assays. It will be remembered that Mr. Kerr promoted and organized the British Canadian Asbestos Company at Black Lake, and the Jacobs Asbestos Company at Thetford Mines, both of which have been successful.

The copper mines opened up during the past two years at Weedon are now shipping regularly, and encouraging reports are being sent out.

Mr. Edward Slade, former consulting engineer and sales agent for the Consolidated Asbestos Mines of Black Lake, has resigned this position, and is now engaged in cement manufacture near Quebec City.

Mr. W. J. Woolsey, mining engineer, has recently returned from an eight months' business trip to Europe.

CANADIAN GOLD FIELDS SYNDICATE, LIMITED

On April 25 the Toronto Globe published the following information relative to a mining company that at one time was operating in British Columbia:—

"Canadian Gold Fields Syndicate shares were traded in yesterday as a part of the movement in Canadian Smelters, which rose to $56 a share at the close. The Gold Fields Syndicate, a holding corporation, owns 4,200 Smelters, which are about all of its assets of more than neligible value. When the Syndicate was paying dividends practically all of its revenue was obtained from Smelters, and as the prospects of the latter company improve, Gold Fields naturally benefit in the market. At recent prices 10,000 shares of Gold Fields are equal to seven shares of Smelter, and some keen buyers have found a better bargain could be secured by buying Gold Fields. There is very little Smelter stock on the market and apparently the Western supply has been pretty well cleaned up."

On April 20 the Globe said: "Bids on Canadian Smelters were off to 55, a point lower than the close on the day before, but Canadian Gold Fields was brisk enough to keep the price at four or better. The leading interests in the company say that there will be no dividend announcement immediately, but it looks as if it might not be out of the way to expect one before the end of the company's fiscal year in June. About 17,000 shares of Gold Fields were purchased on this hypothesis."

Canadian Smelters, it may be explained for the information of those not familiar with the fact, is the name by which the shares of the Consolidated Mining and Smelting Company of Canada, Limited, are usually referred to in the financial section of the Globe newspaper.

The Canadian Gold Fields Syndicate, Ltd., was registered in British Columbia in December, 1896, with an authorized capital of $1,000,000, in shares of a par value of ten cents each. Of the 10,000,000 shares thus provided for there were, at the date of the last balance sheet accessible at present to the writer (namely, that to the end of 1905), 6,000,000 subscribed for. The first mining property it owned was the Sunset No. 2, situated near Rossland, B.C., and on this claim up to April 1, 1898, some 1,300 feet of undergound development work was done by the company. The Gold Hunter and Alabama, adjoining the Sunset No. 2, were purchased and in the directors' report for 1898 it was stated that "the syndicate now owns the largest solid block of any mining company in the mineral belt at Rossland." It was stated, further, that "at different points on all three of the veins, high-grade pay ore has been disclosed, assaying from $36 to $66 per ton in all values." Prior to October, 1899, a shaft to explore No. 1 vein had been sunk 446 feet, and in 1899 a shaft was sunk 110 feet near the intersection of Nos. 2 and 3 veins, but in neither case was any considerable quantity of good ore found. Meanwhile the company had acquired the Lake Shore group of claims, near the St. Eugene mine, East Kootenay, and a 7-drill compressor plant—the first machine drill plant in East Kootenay—was put in, and work was commenced in August, 1899. Within three months fully 20,000 tons of lead-silver ore was blocked out. Then followed a consolidation of the four adjoining groups of claims—the St. Eugene, Moyie, Queen of the Hills, and Lake Shore, and the organization of the St. Eugene Consolidated Mining Company, Limited, with an authorized capital of $3,500,000 in shares of a par value of $1. Of these shares the Canadian Gold Fields Syndicate received 640,000, fully paid up, in exchange for the Lake Shore group. Under the terms of the consolidation, Mr. George Gooderham, of Toronto, for himself and associates, purchased more than 1,000,000 shares of the Canadian Gold Fields Syndicate.

About 1900 the syndicate acquired the Jennie claim, near Rossland, and bonded the Sunset, near Whitewater, but the latter did not come up to expectations, so was not purchased. The Eldon claim was also secured. Then, in 1901, work was done on the Commonwealth group, in Lardeau district, and on the True Blue, near Kaslo, in the respective companies owning which the syndicate acquired large share interests. In this year the syndicate received from the St. Eugene Company, as its share of two dividends paid, $38,400, out of which it declared two three per cent. dividends, together, $35,746.

In 1902, owing to unsatisfactory market conditions for lead, no production was made by the St. Eugene Company, nor was any work done on the Commonwealth property or the Sunset group. Some 60 tons of ore, averaging 9 per cent. copper, was shipped from the True Blue, but cost of sacking, rawhiding, freight and treatment was too high to leave a margin of profit, so operations were stopped. Since then the syndicate has not done much mining on any of the properties under its control.

In 1905 the Canadian Consolidated Mines, Ltd., was formed, and this company acquired the Centre Star-War Eagle group of mines, Rossland; St. Eugene Consolidated group, Moyie, and the lead and copper smelting works at Trail. As an outcome of the adjustment of the several interests, the Canadian Gold Fields Syndicate received 4,260 shares of Consolidated Co.'s stock. Later the name of the larger company was changed to that it now bears, namely, the Consolidated Mining and Smelting Company of Canada, Limited. So long as the Consolidated Company paid dividends, which was until near the close of 1907, the syndicate was enabled to do the same, but since then it has been practically inoperative and non-dividend paying.

GEOLOGY OF NANAIMO, B.C., COAL DISTRICT.

(Reported by E. Jacobs, Victoria, B.C.)

Among the papers read at the Annual Meeting of the Canadian Mining Institute, held in Toronto, in March,

last, was one by Mr. Chas. H. Clapp, of the Geological Survey of Canada, Ottawa, on "The Geology of the Nanaimo Coal District, British Columbia." This subject, as dealt with by Mr. Clapp, related to the Nanaimo district as far north as Departure Bay, south to Ladysmith, and west to the crystalline rocks about and south of Mount Benson.

Points of Geological Interest.

The chief points of geological interest brought out in the paper were (1) that the sediments were deposited on a very uneven surface, having elevations of at least 2,000 feet or more, and on this account conditions of deposition were local and varied, which explains the extreme rapid lateral and vertical gradation of the sediments, and (2) that the coal seams and measures as a whole have been subjected to more or less movement when some of the sediments and at least the cleaner coal of the seams were in a plastic condition. This caused the coal seams to be variable in thickness and quality, which is the chief cause of the great difficulties and expense of mining in that district.

These two chief points were elaborated, and reasons were given for both conclusions; further, comparisons were made with similar variations met with elsewhere. Incidentally, Mr. Clapp expressed the opinion that Mr. H. Foster Bain, who submitted a paper on the "Fuel Problems of the Pacific," had made an extremely shrewd guess in placing the cost of mining coal in the district under notice at $3.50 per ton.

Other Observations on Nanaimo District.

In course of conversation with Mr. W. J. Dick, mining engineer, to the Canadian Commission of Conservation, the following information was obtained by the writer of these notes: The coal measures of this part of Vancouver Island extend from Departure Bay as far south as Duncans, and comprises an area of about 400 square miles, but the productive area is limited to about 65 square miles. This productive area is situated in the northern part of the field—that is in the vicinity of Nanaimo—while in the southern portion the rocks had been badly disturbed and are not clearly differentiated with regard to their proper classification. The coal measures were laid down on the uneven floor of the volcanics, which are known as the Vancouver series and are probably Jurassic in age.

The sediments consist chiefly of conglomerates, sandstones, and shales, and are of Lower Cretaceous age. The general attitude of the sediments is a syncline dipping gently towards the sea. There are four seams of coal. The lowest is called the Wellington seam and ranges from 5 to 9 feet in thickness; this has been worked extensively by the Wellington Colliery Company—now the Canadian Collieries (Dunsmuir), Limited—at Wellington and Extension. The next in ascending order is the No. 2 Wellington, situated a short distance above the Wellington; this is a comparatively thin seam—from 20 in. to 3 ft.—and it has been worked in places. The next seam is the Douglas, which is separated from the Wellington by 850 to 1,000 feet of measures; this seam has been worked extensively by the Western Fuel Company at Nanaimo, and by the Pacific Coal Company at South Wellington. The No. 2 Douglas, or Newcastle, seam is situated at from 50 to 100 feet below the Douglas seam; much work has been done on this by the Western Fuel Company at its No. 1 and Brechin mines.

Discussion of Mr. Clapp's Paper.

In the course of a short discussion that followed the reading of Mr. Clapp's paper, Mr. Dick said: "I have listened with a great deal of pleasure to this paper, in which Mr. Clapp brought out a number of points of considerable importance to the miner.

"The first point is that the coal beds were laid on a very uneven floor on the volcanics. This is especially marked in the Comox field, which is situated about 60 miles to the north of Nanaimo. There, at certain places in No. 5 mine, the coal seam rests directly on the volcanic. There is usually a small thickness of measures beneath the coal seam at Comox, while in the Nanaimo district there is a considerable thickness of blue shales between the coal and the volcanic.

"The next point touched on is the fact that in the different coal seams 'wants' are found; also that movement took place at the time the coal was deposited. This is shown by the slickensided rash and by the silt deposited between the coal in the seams. There was also movement subsequent to the deposition of the coal, as shown by a fault extending from the old No. 5 mine toward the powder works. The downthrow of this fault is about 160 feet. The Baynes sound fault, in the Comox district, has a downthrow of at least 300 feet.

"In this field 'wants' and good coal are often found very close together. For example; in the Alexandria mine 21 feet of good coal is found on the south side, while a short distance away on the north side much thinner coal is found.

"From these facts it can be seen that mining is made rather difficult; also, how impossible it is to have the same schedule of wages on a tonnage basis in all parts of the mine, let alone in different mines. If a man happen to be working in a good place with high coal he would necessarily make larger wages, while in the case of a man working in a district or place where 'wants' are frequently encountered it might be necessary to make up his wages from a yardage, or a yardage and a tonnage basis."

BEAR RIVER COAL FIELD, B.C.

By C. F. J. Galloway, B.Sc.

This promising field is situated in the famous Cariboo district of British Columbia, about 45 miles due east of Fort George, and 80 miles north of Barkerville.

The Bear River (not to be confused with Bear River, Portland Canal, and numerous other rivers of the same name), flows through the field in a northwesterly direction in its course from near Barkerville to the Fraser.

The coal measures lie in a flat basin surrounded by hills consisting of crystalline rock, which define its limits in certain directions, but its actual extent cannot be definitely determined except by extensive drilling, as the ground is entirely covered by alluvial sand, gravel and clay, and bedrock is only exposed in a few places in the bed and banks of the river.

Written for the Canadian Mining Journal.

Igneous intrusions occur in a few places, locally disturbing the measures, but the greater part of the area seems to be entirely free from such disturbance.

An area of fourteen sections of one square mile each is held by Mr. A. E. Hepburn, of Vancouver, B.C., and within this area ten and a half square miles is probably underlain by the coal measures in an undisturbed condition.

A very limited section of the measures is exposed, but at one place three workable seams outcrop in the bank of the river.

Some development work has been done on these, proving them to have the following sections:—

	Total Thickness.	Total Coal.
Upper seam ..	10 ft. 4 in.+	9 ft. 2 in.+
Middle seam ..	5 ft. 0¾ in.	4 ft. 2¼ in.
Lower seam ..	11 ft. 11½ in.	7 ft. 8¾ in.
Total coal		21 ft. 1 in.+

The two lower seams, and the lower portion of the upper one, are to a certain extent interbedded with sandstone and shale, as is seen from the above sections, but the upper seven feet of the upper seam contains only one band of four inches of sandstone. A further thickness of three or four feet of clean coal is reported as existing in this seam above that measured. This the writer could not see, the open cut in which it was exposed being filled with mud, and being so little above the level of the river that the mud could not be removed. This additional thickness must, therefore, be added to that given above, which represents the measurements actually made by the writer.

In the measures immediately below these, numerous thin seams of coal occur, up to three feet in thickness, separated by thin bands of shale and sandstone, and it is quite possible that some of these will come together, forming workable seams under portions of the area. Other thin seams appear elsewhere, apparently on a slightly higher horizon.

Taking the thickness of workable coal in the three seams exposed, the area controlled by Mr. Hepburn may be estimated to contain on a very conservative basis 150 million tons of coal.

The coal is bituminous, bright and fairly hard, and, in the crucible assay, yielded an excellent, hard and firm coke.

The following analyses were made by Mr. J. O'Sullivan, F.C.S., of Vancouver:—

	"A."	"B."	No. 1.	No. 2.
Hygroscopic water	3.5	3.5	6.0	4.0
Volatile comb. matter...	37.5	40.8	37.3	44.4
Fixed carbon	54.0	48.3	54.3	46.9
Ash.	4.0	6.0	1.0	3.5
Sulphur	1.0	1.4	1.4	1.2
	100.0	100.0	100.0	100.0

At the point where the three workable seams are exposed the measures dip at an angle of about 43 degrees, but this appears to be on the flank of an anticlinal roll, and the dip moderates towards the northeast, so that the measures may reasonably be expected to lie comparatively flat under the greater part of the area.

As the ground underlain by the coal measures is all flat bench land, the coal will have to be worked entirely from shafts, practically none being above drainage level.

The ground is well timbered with black pine and spruce suitable for mining purposes.

An inexhaustible supply of water is furnished at all seasons by the Bear River.

This coalfield lies within about fourteen miles of the line of the Grand Trunk Pacific Railway in the valley of the Fraser, above the canyon, being separated from it by Seymour Pass, a low divide, only some 300 feet higher than the coal exposures, the construction of a railway over which will offer no difficulties.

A still shorter line, over an equally easy divide, would connect the coal area with the line of the Cariboo, Barkerville and Willow River Railway in the valley of Willow River.

This line, having recently been granted a subsidy of $6,400 per mile by the Dominion Government, and a bridge allowance of $95,000, will likely be built as soon as materials can be taken in.

(To be Continued.)

MERRILL FILTER PRESSES.

In place of the usual zinc boxes for precipitating the gold from solution, the Merrill process has been adopted at the Brakpan mine. Zinc dust is introduced by a feeding device into a cone, in which it is emulsified with cyanide solution. The zinc emulsion is then fed through a pipe to the suction of the pump, which delivers the solution to the Merrill filter presses. The installation comprises three presses, each having a capacity of 1,000 tons of solution per diem. The gold precipitate is collected in the filter presses, which are cleaned up periodically and the bullion recovered by the usual methods. The Merrill presses are installed in the recovery house, which also contains the smelting and refining plant and amalgamating tables. Thus all the gold recovery processes are conducted under the supervision of one staff in one building. The progress of the Merrill process is growing rapidly in favour in Mexico and throughout the United States of America. It is used at the Homestake, in Cripple Creek, in Nevada, and in many of the mines in Mexico, particularly at the El Oro group.

BOOK REVIEWS.

TEXT BOOK of Cyanide Practice—By H. W. MacFarren—291 pages—Illustrated with half-tones and diagrams—Price $3 net—McGraw-Hill Book Company, New York—Canadian Mining Journal, Book Department, Toronto, 1912.

Not in our time will the last word in cyanide practice be written. As a branch of practical science, the cyanide process has made astonishing strides in the last few years, particularly in the invention of new mechanical devices, and the application of simple mechanical principles.

Mr. MacFarren's new book, like his recent work on stamp-milling, is primarily a working guide. It is not an elaborate exposition of theory. Beginning with a consideration of the nature and properties of cyanide, he follows logically through the solution of gold and silver, the range of amenable ores, the principal chemical data, ore testing, mechanical treatment, precipitation, cleaning-up, etc. An exceptionally comprehensive bibliography, covering 57 pages, and a long series of tables add to the value of the book. The bibliography is a very well-conceived addition.

While, possibly, we may not fully concur in Mr. MacFarren's allotment of pages to the different departments of his subject, yet his book is certainly a readable and careful resume of cyanide practice.

THE ELECTRIC FURNACE PROCESS AS APPLIED TO THE METALLURGY OF STEELS

By Harold G. Ade Stedman, A.M., Inst. E.E.*

Introductory.

Now that electricity has become almost universally adopted where energy in a flexible form, capable of perfect control, is required, and the economies which can be effected by its use having been fully demonstrated, no excuse can be advanced by us for neglecting to give due consideration to its claims as a thermal agent, particularly in metallurgy.

That the use of electricity for metallurgical purposes is now an established commercial process abroad cannot be denied; the total number of electric furnaces in existence is not far short of 1,000, these being mainly employed in the manufacture of steel, iron and non-ferrous metals.

In some respects the progress made has been rapid, in fact more so than that of most of the important processes recently developed. Accurate statistics are not published except by a few countries, but such as are available show, that between 1908 and 1910 the output of electrically-refined steel, for example, has increased four-fold, over 30 per cent. of the high class steel trade having been absorbed.

Cheap Sources of Supply.

In case it should be thought that financial success is only possible where water power is available, it may be stated emphatically that this is not so. On the Continent the refining of steel not only for the best qualities, but for intermediate purposes, and even rails is carried on as a commercial proposition with current costing 45d. per unit, while in the Sheffield district prices up to 65d. are paid. If we except Scandinavia and perhaps Canada, there is nowhere else in the world where current can be obtained so cheaply as on this North East Coast. This being so, there appears to be no reason why much better results should not be obtainable where conditions are so favourable as they are here. A market is opening up for these high class electrically refined products, and it remains to be seen who will have the courage and initiative to supply it.

Object of Paper.

The object of this paper is to place before members some of the main principles which govern the correct design and proportioning of electric furnaces, and their auxiliary apparatus with particular reference to the all-important question of continuous running and low operation costs. In addition, by special request, some of the chief metallurgical and chemical advantages claimed for the process have been outlined, but we must bear in mind, that in the reactions detailed, the electric current must be considered solely as a non-contaminating source of heat, devoid of any inherent chemical properties. It cannot be too strongly urged that the development of this latest heating agent has not nearly reached finality. In the opinion of those best able to judge, much improvement is possible, and when the expert steel-makers of this country really take the matter in earnest, considerable advances in method and efficiency may be expected. It may be safely said that the results now obtained with the Bessemer and open-hearth processes were not thought possible in the earlier days, and those who are tempted to criticise too seriously the somewhat inconsistent results of the first attempts to introduce electric melting, should reflect on this; particularly as most of the pioneering work has been accomplished by electrical men rather than metallurgists. At the present time it is possible by experienced and skilful furnacemanship to produce electrically refined steel, of any required grade and analysis, better than it can be done by any other process. At the time of writing, there are no electric furnaces in commercial operation on Tees-side, and this is to be regretted, but when once a new method is adopted hereabouts, it is usually on a large scale. For instance, in 1907 there was not a single electric rolling mill running in Cleveland, whereas now there are no less than eight with an aggregate horse power of 25,000. Others will, no doubt, follow.

*Abstract of paper read before the Cleveland (England) Institution of Engineers.

Essential Forms of Furnace.

Those who have followed the subject will agree that, although a great number of different furnaces have been patented, the number of distinct types in commercial use is comparatively small. Plate No. 1 gives purely in diagrammatic form, the principal types which have been evolved.

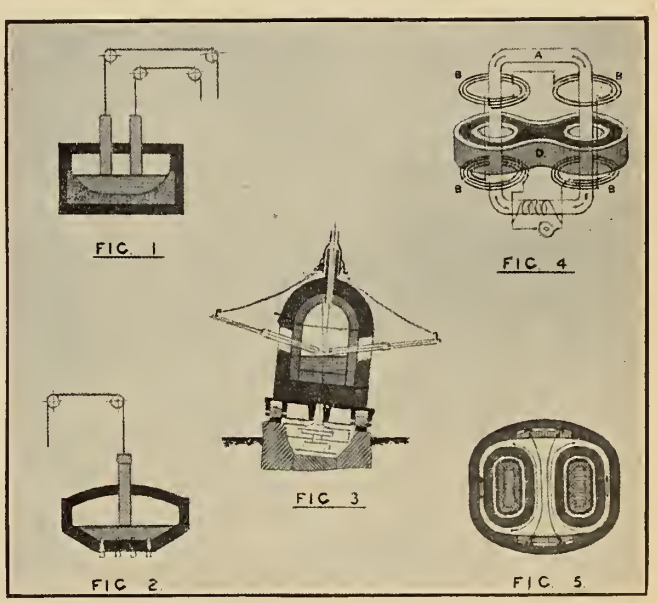
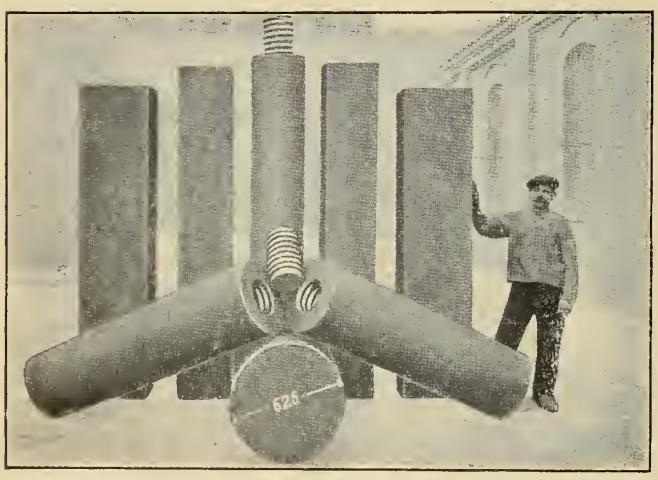


Diagram of Furnace Types.

Figure 1 shows a form which is remarkable for its simplicity no less than for the successful results which have been attained with it since its introduction in 1900. You will observe that a striking similarity exists between it and an ordinary open hearth steel furnace, the chief difference being that instead of the usual gas ports at each end there are openings in the roof through which the electrodes enter and dip into the bath. Two of these are shown in the sketch and single-phase current will be required. The larger sizes of furnaces are arranged for three-phase, and consequently have three electrodes passing through the roof, which is scarcely practicable in the small sizes, as the roof would be too much weakened.

One of the features possessed by this type is the absence of electrodes embedded in the hearth, which fact would probably appeal to most steel makers who are accustomed to ordinary practice. Several modifications of this principle differing only in detail are being used in practical steel melting and refining. In order that the atmosphere of a furnace may be under full control, it is important that as little air as possible be admitted through the electrode openings and charging doors. That the roof is protected by using large electrodes from the direct radiation of the arcs is a possible advantage, but the claim sometimes made that heat losses are reduced thereby is fallacious; it is also doubtful if an increased area of electrode appreciably affects the current density of the arcs on the slag. Those who have watched the behaviour of the arc, even in a large furnace using heavy currents, will have observed that it is always focussed on a comparatively small area which travels about over the surface of the electrode in a very irregular manner. In the single-phase form, with two arcs in series on a thin slag layer, heavy fluctuations of current occur; as owing to the large amount of power passing over a distance of say 1 inch or 2 inches, and within a comparatively small area, the gases in this space are highly super-heated and expand violently, thus setting up a commotion which causes the metal to jump up and touch the electrodes. With three electrodes only there is some difficulty in perfectly balancing the phases.

Figure 2 is really an improvement, adapted for steel refining, of the simple pit furnace used so extensively in the manufacture of calcium carbide and ferro-alloys; it has been made broader and shallower with a roof similar to figure 1. Essentially it is a single-phase



Group of Modern electrodes made by The Platnia Company. (Note the method of jointing by screwed coupling.

furnace, but different designers have succeeded in producing two and three-phase modifications. In the figure one or more carbon electrodes, having the same polarity, pass through the roof and dip into the bath while the return circuit is completed through the metal itself by means of mild steel electrodes passing through the bottom. These electrodes are water-cooled on the outside, and spaced evenly so that the current divides equally between them. For use with two-phase currents two electrodes can be passed through the roof while the bottom is connected to the common return. It is claimed that by this means current fluctuations are reduced by one half as the arcs are not in series, and a very good circulation of the metal is obtained due to currents set up by the horizontal and vertical components of the two-phase circuit. Yet a third variation has been evolved using three-phase current, and in this form there are three electrodes of carbon passing through the roof and three of metal embedded in the lining. Both top and bottom electrodes can be used separately or together. By their simultaneous use the slag is heated from above as in the form shown by figure 1, and at the same time the metal is kept hot and circulated from below. Unfortunately, no definite results are yet available as to the behaviour of this latter design, hence much comment would be premature. It is claimed among other things that the size of carbon electrodes is reduced by half, thereby considerably lowering the cost of same, also that the final de-gasifying can be accomplished by heating the metal from below only.

Figure 3 illustrates an interesting though more complicated form of furnace well adapted for special work. In this type the carbon electrodes do not come into contact with the charge at all, and the heating is affected by radiation alone. The diagram shows that these electrodes enter the sides inclined at a small angle from the horizontal, an arc being struck just above the bath. Three-phase current is now generally used with three electrodes, which are water-cooled on the outside. In order to obtain efficient circulation of the bath, the whole furnace can be mounted on a circular plane inclined about seven degrees from the vertical, which enables it to be continuously rotated during the melting and refining operations. In order to convey the current to the electrodes, slip rings are provided; in this particular diagram they are shown at the top. Comparatively small electrodes are used. From a thermal point of view this design is efficient, and steel having a very low carbon content can be easily produced; as no contact with the electrodes is made. The fact that both roof and sides are subject to direct radiation from the arcs is, however, a possible drawback.

Figure 4 is different in principle, as well as in appearance, from those previously described, inasmuch as the metal to be heated forms the closed secondary of a static transformer of special design. Following the diagram: "A" is the core built up of the usual thin sheet iron stampings bolted together. "B" shows the primary windings which are connected to the source of supply and provide the necessary magnetic flux whereby heavy low-voltage currents are induced in the melting-rings, "C" when they contain metal. "D" is the refractory material composing the hearth proper. In this manner a fairly high voltage can be used, and the use of energy-absorbing electrodes and heavy copper conductors is avoided.

The practical development of this principle has to a great extent been handicapped by the awkward shape necessary and the extreme difficulty of getting the primary turns near enough to the secondary or metal bath, the result being that a considerable leakage of the magnetic flux takes place, causing what is known as a low power factor.

This form of furnace possesses the advantage of very steady load demand and good efficiency, and as a simple melter of high class materials has given good results. The most successful method of improving the power factor and increasing its suitability for more general work is shown in figure 5, which is a plan view of a similar arrangement to figure 4, except that

the primary windings are on the inside of the hearth and an auxiliary set of windings, connected to steel electrodes embedded in the linings, are provided. Currents pass as shown by the arrows. The effect of this arrangement is to reduce the stray field or magnetic leakage and enables the furnace to be operated on systems of normal frequency. The proportion of total current carried by the electrodes is about 30 per cent.

No Best Type of Furnace.

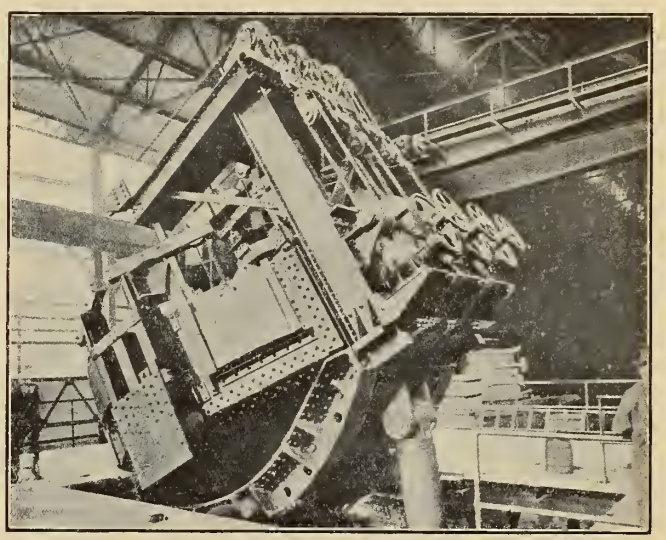
Having by the aid of simple diagrams, pointed out the essential forms of furnace at present in use, we can proceed to examine in detail some of the more important points concerning their construction, efficiency in operation and general suitability for the particular object in view.

As a general proposition it may be stated that there is no one make of furnace which has made good its claim to be the best for all purposes.

Furnace Electrodes and Clamping Devices.

The question of electrodes is of vital importance, both from the electrical and metallurgical points of view, and as most of the literature on the subject is not only vague, but contradictory, we shall endeavour to review the subject so far as it affects us here. The manufacturing details are naturally kept as secret as possible, but approach very nearly to ceramic procedure. With the latter a plastic clay is employed as binding material, whereas tar residues are used in the manufacture of electrodes. Essentially the plant consists of crushers for treating the raw material, viz.: Retort carbon, anthracite, charcoal, paraffin-coke, graphite, and soot. Mixers for working the materials up in suitable proportions with the binding medium. Hydraulic presses of large size for moulding and compressing the material into the desired shapes. Gas-fired ring ovens for final baking.

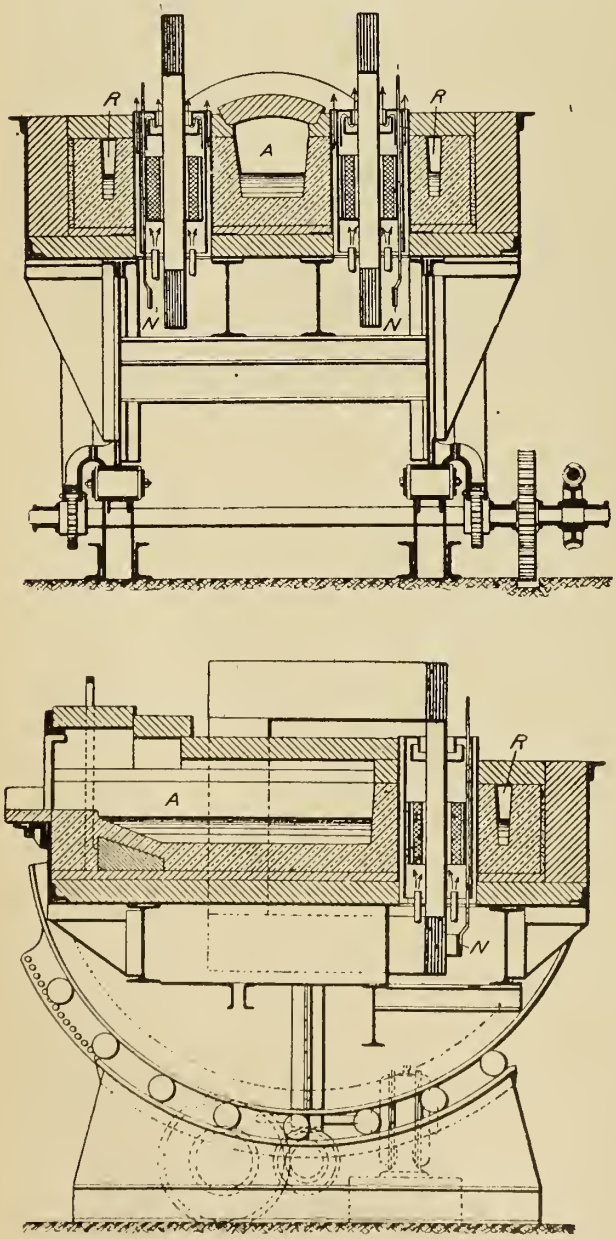
The raw materials are subjected to a preliminary heating for the elimination of gases and oils. They are then masticated with the binder and pressed into shape. The blocks thus formed then go through a burning and shrinking process in the gas-fired ring ovens, from which air is excluded, at temperatures up to 1,500 deg. or 1,600 deg. C. The time taken varies from 6 to 10 days with smaller sizes and up to 16 days for the large electrodes. Heating must be gradual and evenly applied, otherwise tension is produced within the material which may lead to cracks and flaws. After cooling down the product is ready for use. The principle of this method must be attributed to the Frenchman, M. Carre, although his investigations related to carbons for arc lamps. The difficulty of obtaining reliable electrodes has been considerable in the past, but now a material of excellent quality can be obtained. As a result the consumption of electrodes has been reduced by 50 per cent. Since the electrodes only form avenues through which current is introduced to the charge, it is important that they should neither contaminate the charge nor cause undue waste of energy. For this reason carbon, in the amorphous state, is now almost exclusively used for all electrodes except those which pass through or are embedded in the bottom linings as shown in figures 2 and 5, these being made of mild steel. Graphite has been used, but is much more expensive than amorphous carbon, while the consumption is about the same. In furnaces such as shown in figure 1, where the whole current is carried by two or more roof electrodes, the consumption of electrodes varies from 6 pounds to 12 pounds for refining only, and from 14 pounds to 35 pounds for melting and refining cold charges. Energy losses in the carbon work out at about 8 per cent. of the total input, and where cooling water is used this may account for another 3 per cent. When the current is fed into the end of the electrodes as in carbide and ferro-alloy furnaces, the connections are applied by means of head sockets, whereby they are firmly attached once for all. The other method is to use clamps, which permit of the electrode being passed through them and whose clutches are merely pressed tightly against the smooth hard surface of the electrode. These latter are mostly adopted in steel furnaces. All current carrying parts are usually of copper or bronze, the main posts and supports being of steel. The dimensions of the contacts assume a current density of 20 to 30 amps. per square inch, and as it is extremely important to make sure of getting good contact the surfaces of the electrodes should be as smooth and hard as possible, while a few layers of copper gauze between it and the clamps is an excellent precaution to take. Unsatisfactory connection will cause the carbon to glow in places about the clamps, and sometimes results in breakages; in any case it is detrimental to the life of the electrode. This evil is aggravated in that carbon conducts better, the hotter it is, hence the current will increase in the hot parts and make matters worse. Water cooling the holders is usually, though not always, applied. An important question is the choice of a suitable sectional area. The permissible current density for each material can, for the present, only be determined by empirical rules. Generally the best possible electric and worst possible thermal conductivity is desirable in order to reduce the generation of heat to the electrode itself and the transfer of heat from the charge. It is found that small electrodes can be loaded up more than large ones; possibly owing to the greater closeness with which the particles are packed. In view of this, modern factories have adopted increasingly larger presses in order to reduce this discrepancy and improve the larger sizes. Again, for the same composition, the specific resistance of round electrodes is much less than that of square sections. As to the ultimate sizes which could be produced, little can be said, but whereas up to a year or so ago the largest electrodes of sound quality on the market were 400 mm. diameter, it is now possible to get them up to 625 mm. without



Heroult Furnace for Refining Steel. Capacity 15 tons. (The motors seen on the rear platform operate the electrodes)

difficulty. Nevertheless it may be doubted if sizes will go on increasing since the specific conductivity tends to decrease, as well as the mechanical strength, while difficulties of handling increase. Attempts are now being made to increase the conductivity of electrodes by introducing metal, such as pure iron, with the carbon material whilst it is being moulded. The resistance of electrodes thus formed can easily be reduced to one half the ordinary value with comparatively little metal. The process, which is of special interest in connection with the employment of long unbroken electrodes, would also provide means of introducing certain physics to the charge, and may lead to important developments in the near future. In present practice it is usual to make the feeding up of fresh electrodes a continuous process, connecting each new length to the previous one by nipples moulded with a screw thread out of the same material as the electrodes. A certain amount of loss takes place at these joints, varying from 2 to 2½ volts per connection with current densities of 30 amps. per square inch, and the saving in electrode material and time has to be balanced against these losses.

The Roechling-Rodenhauser Electric Furnace.



A.—CENTRAL PORTION WHERE REACTIONS TAKE PLACE.
R.—MELTING RINGS IN ELEVATION.

The raising and lowering mechanism, for regulating the electrodes, whether hand or motor operated, must work smoothly and evenly; and as the current conductors usually move over the same range, they must be sufficiently flexible to prevent any risk of abrasion or fracture.

Other requirements are — strong and workmanlike construction, with no parts likely to suffer damage due to the rough usage of a steel works, or to be affected by high temperatures; firm and solid clamps or sockets which will not only grip the electrode properly, but also possess low ohmic resistance and easy means of rapidly releasing or tightening up on same when compensating for consumption of carbon.

The Electric Process in the Steel Foundry.

The production of steel castings by ordinary methods leaves much to be desired, the metal is frequently spongy, unequal in appearance, and of varying composition; requiring time to be spent in filling up blowholes, flaws, and generally making the castings look presentable. Now the production of steel castings by the electric process has been both technically and commercially successful from the very commencement, and not only so, but the improved quality of material produced has more than fulfilled the most sanguine expectations. Moreover, the ease with which an electric furnace can be manipulated compares most favourably with either open-hearth or converter methods, and is, except under most exceptional circumstances, a vast improvement on crucible melting in this respect. In the manufacture of small and intricate castings full advantage can be taken of the perfect thermal control, combined with thorough "killing" of the metal, which is obtainable. Not only can clean, sharp castings be produced of any size and composition, but their behaviour under mechanical tests is altogether in favour of the electrical method. It is quite easy to obtain castings of definite grades having tensile strengths up to 44 tons per square inch, and, owing to their being homogeneous throughout, the work of machining is facilitated with considerable reduction of wasters. This is of general interest and of particular interest to makers of railway, motor car, marine, and electrical machinery castings; where the ability of the electric furnace to give larger casts with cheaper and cleaner melting is most valuable.

Based on the most recent figures it should be possible in this district to produce metal in the ladle for steel castings of the finest quality, with sulphur and phosphorus reduced to traces, at approximately £6 per ton if scrap is used, or £5 when finishing molten metal from converters. With cheaper metal there would naturally be less temptation to cut down the weight of gits and runners. It may be urged that few foundries are so situated that a supply of molten metal is available and even where a steelworks exists within a short distance, the difficulties of transport and subsequent transfer to the electric furnace are considerable owing to the rapidity with which the metal freezes. As a possible solution of this difficulty the author would suggest that it might be practicable to construct a furnace somewhat on the lines of a Dewhurst ladle, having a closely fitting roof of silica brick built into a frame with apertures through which the electrodes could be introduced. This could be charged from,

say, a Bessemer converter and then shunted down to the adjacent steel foundry, there to be placed or run under a special mechanism carrying electrodes and gear for controlling same. Slagging material and flux could be added when charging and serve the additional purpose of reducing heat losses during transit. As soon as possible the current would be turned on and a refining temperature regained, after which, de-oxidising and dead-melting would follow. When the finished steel had been teemed into ladles for casting it would probably be necessary to do some fettling, whereupon the cycle of operations could be repeated before the temperature fell too low. As an alternative molten pig might be used instead, but the refining would take longer. That some such method would result in notable economies is self evident, and development along these lines may be anticipated in the near future.

In contemplating in what directions development may occur, it would appear that such works as shipyards, machine shops and engineering works generally promise a wide sphere of usefulness for the small electric furnace of from one ton upwards, producing castings from the waste material available such as scrap, trimmings, turnings, borings, etc. In melting light scrap by ordinary methods it is quite usual to lose from 20 per cent. to 40 per cent. of the metal by oxidation, whereas there is only a few per cent. loss in the electric furnace. With regard to the most suitable form of furnace equipment for producing castings, much might be said. As a matter of fact, all the types shown on our first diagram have been used for this purpose under slightly varying conditions. With full data available as to the requirements of a prospective user, and the conditions under which he will operate, it is not a difficult matter for an experienced electro-metallurgist so to advise that success will be assured.

The Electric Process for High Grade Tool Steel.

Only in the case of firms who require to make special steels, differing considerably in composition, a few pounds at a time, can the costly and troublesome crucible remain in the field much longer. For the present, perhaps, this trade will remain in the hands of the Sheffield melter, but unless some re-adjustment occurs there, resulting in the adoption of modern methods, the bulk of it is likely to pass into other hands. At the present time there are only three or four electric furnaces in operation at Sheffield. With the passing of the crucible, other districts, including Middlesbrough, will have no technical reason for not competing with America and the Continent for a share of the tool steel trade. As to the relative costs of the two methods, it may be stated generally that the more fuel necessary for carrying out any steel making process, the better will electric heating compete with that process, hence it should be pre-eminently suitable for replacing the crucible which requires an expenditure of from 60/- to 70/- per ton on coke alone for melting, whereas a well designed electric furnace will, in this district, both melt and refine, such scrap material as rail-heads at a cost not exceeding 24/- per ton. This is a marvellous difference in itself, to say nothing of the additional saving as between the cost of pure iron and common steel scrap.

The destructive criticism levelled against the earlier electric steels by makers whose trades were dependent upon the continuance of older methods, proves that they considered its rivalry serious. Just now a demand for large ingots of crucible quality is rapidly growing, and in making such casts the use of crucibles presents great difficulties, which are increased by the fact that the melter has to teem a number of pots simultaneously with risk of variations in quality. A two-ton electric furnace cast is easier to make than a 50 or 60 pound crucible cast, and the metal is more homogeneous and less brittle for a given carbon content; hence it can safely carry more carbon than crucible steel.

The Electric Process for Intermediate Steel.

Turning now from castings and tool-steel, in the manufacture of which the electric process is admittedly unrivalled, we find that in the intermediate class between them and ordinary constructional steel, some doubts still exist in certain quarters as to the economic advantages to be gained by giving steel, intended for rails, shafting, wire, special boiler plates, tubes, etc., a refining or finishing treatment in the electric

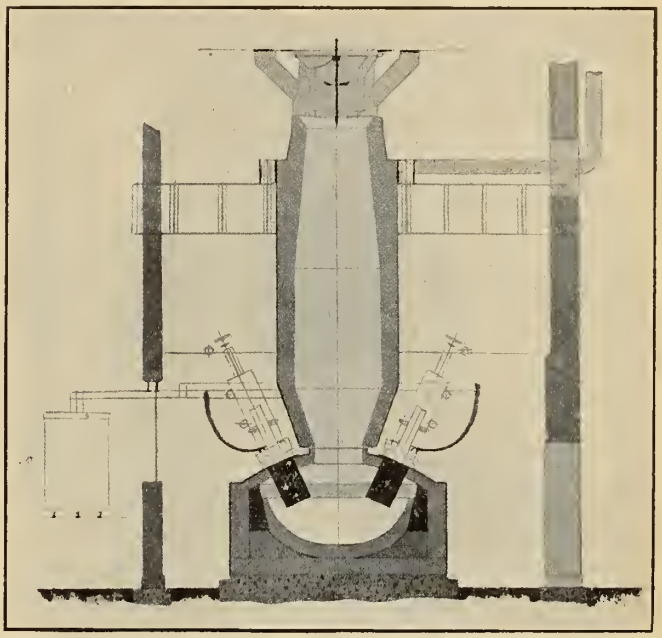


Diagram 1.—General Arrangement of Furnace.

The Electric Iron-ore Reduction Furnace as developed in Scandinavia.

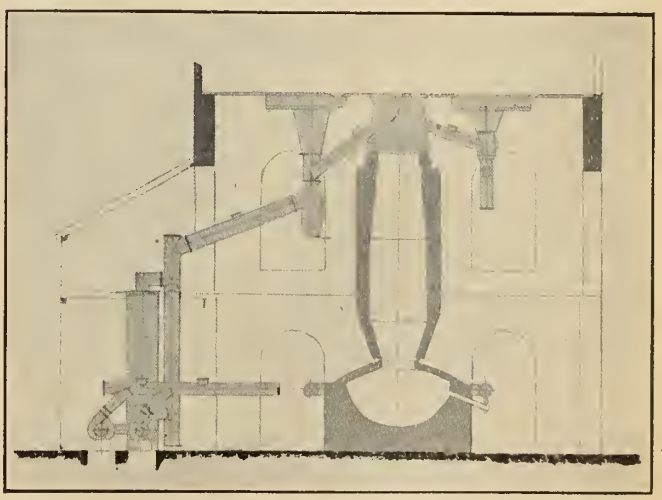


Diagram 2.—Gas-Circulating System.

furnace. Much emphasis has been laid on what are termed the limitations of the electric process, and many arguments have been used in an attempt to prove that, for the above purposes, steel as at present made is sufficiently good. Probably few who are really familiar with the subject will deny that steel, which has been so finished, compares most favourably with the very best products of the open-hearth furnace. The superiority of electrically refined steel over other steels depends chiefly on the reducing conditions obtainable without sacrificing temperature. The chief points of improvement are greater tensile strength, increased durability, much greater resistance to corrosion, and less liability to segregation in various forms. These features depend not so much on the lowness of phosphorus and sulphur, as on the freedom of the metal from oxides, occluded gases, and what have been termed slag emulsions. As matters stand at present, it would appear that the whole question turns more on commercial than on technical points, and one is therefore compelled on account of the many complications existing between the actual steel maker and the consumer, to preserve an open mind on various aspects of the case which might otherwise be argued out to a definite conclusion.

Assuming for the moment that a demand should arise for materials, complying with much more stringent specifications than at present, as it will arise, then the adoption of the electric furnace for this class of work will become inevitable. This need not necessarily imply any scrapping of existing converters or open-hearth furnaces, provided they are working efficiently. With cheap current, it may be better to take metal direct from the mixer. One objection which has been urged against this extra refining stage, viz.:—the transfer of molten metal from one stage to the other, might be surmounted by careful disposition of the furnaces, and the use of suitable launders.

Another aspect of the case arises out of the heavy losses occurring in the slag, with ordinary methods, which can be reduced to a few per cent. of iron with the electric furnace. In an open-hearth furnace, owing to the limitations of temperature, it is apparently necessary to retain some oxide of iron to ensure a fluid slag, whereas the high temperature of the electric arc enables a fluid slag to be maintained practically free from oxide. Mr. Harbord has stated that in some samples of slags from the electric furnace, which he had taken at various times, there was no more than 1 per cent. of iron.

Yet another possibility presents itself; by working in conjunction with an open-hearth furnace, the charge, as soon as the carbon is down, is transferred to the electric furnace for the removal of sulphur and final de-oxidizing; thus substantially increasing the output.

There is also the possibility of saving in cost of raw materials, as the use of pig from local ironstone in place of more expensive foreign ores may save several shillings per ton.

Again, the electric finishing of metal from a basic Bessemer plant is neither so costly nor so troublesome as might be supposed. The electric furnace occupies comparatively little room, and the transformers can, if necessary, be placed in chambers beneath. Therefore, no great difficulty should be experienced in working one or more of these in tandem with the existing converters, and without involving either starving or choking the mills. The added cost to the price of finished material, such as rails, need not exceed 4 per cent. including cost of current, repairs and interest. Why adopt the policy of scrapping existing converters and replacing them by fixed open-hearth furnaces? The need for such a change surely implies that furnaces having a wider range are essential to modern conditions. Why then not instal electric furnaces and obtain the maximum of flexibility without clearing out the converters and their auxiliary plant? The actual labour item is exceedingly low.

The Electric Process for Ferro-Alloys.

In most metallurgical processes connected with steel the part played by the various ferro-alloys is becoming more and more conspicuous; and it is therefore gratifying to find that all of them can be and most are, made by the electric process. In fact the production of alloys such as high-grade ferro-silicon, ferro-chrome, and ferro-tungsten, is only made possible by the electric furnace. That a considerable impetus was given to this industry by the carbide slump a few years ago is beyond doubt; some outlet for plant and power available being a necessity. The open-pit furnace is in pretty general use for this work and is similar in construction to the small furnace on the table, which was designed by the author for experimental work in connection with ferro-alloys, except that it does not tilt, and therefore, has to be tapped at the bottom.

An interesting development is in connection with the difficulty reducible titanium alloys which are now very largely used in America for de-oxidizing purposes, where it also claimed that owing to the well known affinity possessed by titanium for nitrogen it is able to remove nitrides which are unaffected by manganese and silicon.

Ferro silicons of all grades up to 75 per cent. Si. are made commercially; also ternary and quaternary alloys which are now in considerable demand for the special steels. By the electric process the carbon content can be kept very low, which point is of considerable importance. An extraordinary amount of attention is being devoted to this branch of metallurgy just now.

The Electric Process for Pig Iron.

At present much interest centres round the use of electric heating for the direct reduction of iron from its ores and the elaborate experiments which have been carried out in Sweden and California have proved definitely that, given a plentiful supply of very cheap power, it is not only possible, but probable, that extensive developments will occur in the near future. Assuming this very cheap power, the two most important features of the process consist in (a) saving all that part of the carbon required for heating purposes only (about two-thirds), and (b) utilization of vast deposits of ore which are not suitable for use in the blast furnace. Its application in this district for some time to come is improbable. As a matter of interest, however, views of the latest forms of furnace are shown on the screen from which it will be seen that in shape and general arrangements some similarity exists between them and the blast furnace. The furnace in operation at Trollhattan and the method of working was fully explained to the author by the courtesy of the engineer in charge. Three-phase current is received and transformed to two-phase by Scott connected transformers which supply the four electrodes spaced evenly round the hearth. The nominal rating is 2,000 kw.; actually the energy required varies between 1,500 and 1,800 kw., but is very steady. The thermal efficiency was given as over 80 per cent., which compares favourably with that of an ordinary blast furnace, which is supposed to be about 70 per cent. On the occasion mentioned the charge was rich in iron, and both iron and slag were being tapped

together, the slag running off to one side. The reducing agent used is charcoal, and various grades of ore have been dealt with. Notable success has been achieved in the smelting of magnetic concentrates; a charge containing 65 per cent. of this material is stated to have caused no inconvenience in working, although the design of shaft is not the best possible for this purpose. The constructors believe, that with special design, all fine concentrates could be used. When calculating the burden the quantity of charcoal is kept constant, and the amounts of ore and limestone varied to produce the desired grade of iron. A typical charge was given as:—

Magnetite	266 kg.
Concentrate	133 "
Mill cinder	11 "
Limestone	32 "
Charcoal	100 "

This is all added together and charged at one raising of the bell, and tappings are made every 18 charges or four times per 24 hours. The maximum output is obtained when making white iron—a small piece of which is on the table together with a micro-section. An approximate analysis is given:—

c.c.	g.c.	s.i.	s.	p.	m.
3.76	Traces	.33	.036	.01	.35

One characteristic of the iron, apart from absence of graphite carbon and low silicon, is its freedom from oxides.

An important feature is the gas circulating system which is shown on the screen. There is, of course, no air blast. Power consumption is around 1,800 units per ton of pig produced.

Theoretically the electric reduction furnace needs only be about one-twelfth the size of an ordinary blast furnace for the same output.

Conclusion.

In conclusion one may perhaps be pardoned for again laying emphasis on certain fundamental points which cannot be overlooked if success is to be attained. These points have either been forced upon one's attention when visiting or studying the lay-out of existing works, or else have formed the subject of discussion with practical experts in electro-metallurgy. They may be tabulated somewhat as follows:—

1. Obtain unbiased expert advice before deciding on the form of equipment to adopt for the particular purpose in view.
2. Avoid unnecessary elaboration when first commencing, and on no account overburden with capital.
3. Proceed slowly with well-tried plant, and, if possible, leave the generation of the necessary current to those who give their whole time to it.
4. See that the electrical equipment is of the best and make provision for varying the voltage at the furnace terminals so as to ensure full thermal control.
5. Carefully compare the terms offered by different makers in connection with royalty charges. These are generally devised on a sliding scale and vary according to nature and scope of manufacture. They might be based on tonnage of finished product, tonnage of metal in ladle, or even on the amount of electrical energy consumed. On no account must they be allowed to cripple a process financially.
6. Bear in mind that the electric furnace is not an automatic machine and needs, like most other engineering processes, trained men and skilful supervision.
7. Do not allow enthusiastic advocates of electrical methods to give you the impression that the steel industry is merely a good dumping ground for electric furnaces. Electric furnaces are made for steelworks—not steelworks for electric furnaces.

ERNEST ADOLF SJOSTEDT

(Deceased.)

Mining and Metallurgical Engineer.
Written for The Canadian Mining Journal by S. Groves.*

In the list of those who went down with the ill-fated White Star liner S.S. "Titanic," April 15, 1912, was the able mining engineer and metallurgist whose portrait appears above. Mr. Sjöstedt was returning from Europe, where he had been investigating the economic treatment of the low-grade copper ores of Norway and

Sweden—under commission by the Lake Superior Corporation. This expert technical knowledge was to have been applied to the production of ferro-nickel pig in a proposed electric furnace plant of magnitude at Sault Ste. Marie. He was also under commission by Dr. Eugene Haanel, Director of the Mines Branch of the Department of Mines, to investigate the latest processes and machinery applicable to the concentration of low grade copper ores; to make such a study of the ores of Norway and Sweden, as would enable the

*Editor the Publications of the Department of Mines, Ottawa. This article was secured through the courtesy of Dr. Eugene Haanel, Director of the Mines Branch.

teehnical experts of the Government to eompare the ores and their economic treatment with the ores and conditions prevailing in Canada; and to report on the advanee made in, and the present status of, the eleetrie furnace, pig-iron industry in Northern Europe. All this invaluable information has been lost, and the investigation will have to begin over again.

Mr. Sjöstedt is a typieal example of the many eapable teehnical experts who are giving Canada the benefit of their practical training in the great industries of Europe: thus enabling this eountry to begin where Northern Europe leaves off. In view of this faet, a biographieal sketeh of Mr. Sjöstedt's teehnieal career, will, no doubt, be of speeial interest to the readers of The Canadian Mining Journal. Before doing so, however, it will be as well to set forth the latest phase of the lamented metallurgist's work in Canada: gathered as an abstraet of notes prepared by Mr. R. Turnbull, of Welland, revised.

Mr. Sjöstedt as ehief metallurgist to the Lake Superior Corporation,—who own two pyrrhotite ore mines in the Sudbury district—made a speeial study of the eharaeter of these ores, and beeame quite an enthusiast as to the possibilities of obtaining a ferro-niekel pig-iron by direet smelting from the ore, thereby saving not only the iron in the ore, which by present methods employed in Sudbury, has to be slagged off and thereby lost, but obtaining the nickel itself at a lower eost.

Mr. Sjöstedt's argument was, that sinee in the present manufaeture of niekel steel, niekel, in its pure form, has to be added to the steel in the open-hearth furnace, there is always a danger of niekel being unequally mixed with the steel; thereby produeing in some parts of the bath a steel of high nickel content, and in other parts steel with little or no nickel. By the use of pig iron eontaining the niekel, a more homogeneous bath would result, and the eost be lessened, as compared with steel where the pure metal was employed.

The main diffieulty which eonfronted him was the presence of sulphur in the ore, as even after a good roasting, the ore still eontained from 1½ per eent. to 3 per eent. of this impurity, thus rendering its use impossible in blast furnace practiee. The wonderful energy of Mr. Sjöstedt, however, solved the problem, and it is to his eredit and renown that, without any practical knowledge of electrieity, and with very inadequate apparatus, he eonstructed an eleetric furnaee, whieh probable expert eleetro-furnaeemen of to-day would call a freak, but from whieh he managed to produce a niekel-pig eontaining over 4 per eent. nickel, about 1½ per cent. eopper, and with the sulphur as low as 0.010 per cent.—a remarkable result!

From this time, to the day of his untimely death, Mr. Sjöstedt became a thorough believer in the possibilities of the eleetric furnace. It was, therefore, one of the pleasures of life when he witnessed the sueeessful government experiments at Sault Ste. Marie in the winter of 1905-6: the making of 55 tons of pig-iron from titaniferous, nickeliferous, ferro-pyrrhotite, sulphurous, magnetic ores, by the electro-thermie proeess, on a practically commercial scale: thus confirming the crude experiments made with his miniature eleetric furnace—operated with 110 volts.

At the conclusion of these Government experiments conducted by Dr. Eugene Haanel, the experimental plant was taken over by the Lake Superior Corporation, and Mr. Sjöstedt—as metallurgist to the company—produced, during four months' operation, about 200 tons of ferro-niekel pig, of whieh the sulphur eontents were kept on an average, below 0.015 per cent.

During the last five or six years Mr. Sjöstedt devoted a large part of his time to the study of the ferro-nickel problem, and perceived the great possibilities of the process, whieh would put Canada with her unlimited supply of pyrrhotite ores in the Sudbury distriet, and her numerous water powers, at the head of all nations as a produeer of nickel-steel. There is no doubt, but that he aequired during his trip to Europe this year, valuable information on the latest eleetrie furnace praetice in the production of pig-iron: data whieh would have been of immense service to those who sent him to Europe, in their endeavours to solve the problem of produeing ferro-nickel pig, as proposed by Mr. Sjöstedt.

The man has gone, but his work remains, and let us hope that the day is not far distant when Mr. Sjöstedt's prophecies as regards the future treatment of the Sudbury pyrrhotite ores, will become an established faet. There eould not be a better or more suitable monument ereeted to the memory of one who may be considered as one of Canada's most eminent metallurgists, than to see all niekel-steel in the future, made from ferro-niekel pig, from the ores of the Sudbury mines, and all in the eleetric furnaee, as advocated by Mr. Sjöstedt.

Ernest Adolf Sjöstedt was born in Sweden, and edueated at the High Sehool Skara, and Royal Sehool of Mines, Stoekholm, graduating in 1876. In 1877 he was engaged as metallurgieal ehemist at the famous Le Creusof Works, Franee. From there, in the same year, he migrated to the United States, and was employed as assistant ehemist in the works of the Bethlehem Steel Co., Pennsylvania, under John Fritz. In 1879, he eonduеted experiments in the roasting of ores at Katahdin, Me.; and for five years was in eharge of the ehareoal iron furnaces at Shelby, Alabama, and Cherokee, Georgia, 1880-85. Inability to stand the southern elimate, however, eonstrained him to move north, and he was re-engaged by the Shelby Iron Works Co.; re-built their furnace plant, and remained as works manager until 1890. In 1890 he visited Sweden, then re-erossed the Atlantic, landed in Canada, and built ore roasters at Bristol, Quebee. He then organized the Pietou Charcoal Iron Co., and built the furnaee plant at Bridgville, Pietou County, N.S., remaining there for six years as general manager. After another trip aeross the Atlantie—investigating the mines and metal works of Northern Europe, for the purpose of writing a series of deseriptive articles for the Iron Age: on the iron and steel exhibit at the Stoekholm Exhibition, he returned to Canada, and established a ehemical laboratory, and eonsulting mining engineers' office, in Montreal—1897: making a speeialty of designing refraetory ore roasting furnaees and gas produeers. The reputation thus made, led in 1898 to his engagement by Mr. F. H. Clergue, as chief metallurgist to the Lake Superior Power Co. at Sault Ste. Marie; remaining in this important position for one year, then was sent to Europe to study the water gas industry, and kindred processes. Upon his return he designed and built, the "Soo' water gas plant, reduction plant, sulphide roaster, the ehareoal plant—since taken over by the Standard Chemical Co.

Mr. Sjöstedt was the inventor of the Sjöstedt sulphide roaster; the Sjöstedt eleetrie smelting furnace; and the Sjöstedt-James electrolytie process for the separation of copper and nickel, etc.

He was elected a member of the Canadian Mining Institute in 1890; American Institute of Mining Engineers, 1893; and the American Electro-Chemical Society, 1903.

He leaves behind a wife—Jessie Kathleen, daughter of J. C. Winslow, Q.C., Woodstock, N.B., a lineal descendant of Edward Winslow, one of the Mayflower Pilgrims, and first Governor of New England, and a daughter, Mrs. McAdams, of Toronto. He was a Protectionist in politics, and a Lutheran in religion.

THE DOMES OF NOVA SCOTIA

By T. A. Rickard.

(Continued from last issue.)

PART II.

Alfred R. C. Selwyn.

In the following year, 1871, Alfred R. C. Selwyn, famous as an Australian geologist, published his "Notes and Observations on the Gold Fields of Quebec and Nova Scotia." He expressed disagreement with Hunt and Hind, and quoted with approval the generalizations of Lieber (Geological Survey of South Carolina, 1856). Selwyn repudiates the idea of contemporaneity as between the quartz and the sedimentary rocks. He says:

"All veins are younger than the country; and hence it is without any reason that many writers regard those only as veins which dip or strike unconformably with the country-rocks, for it is evidently quite immaterial what peculiar relative position is occupied by the two as concerns the origin or the general characters of the veins. Crevices may be formed in any direction, and it is but reasonable to suppose that the planes of stratification, being possessed of less cohesion, will at least as readily present themselves for the formation of cracks or fractures as those planes which traverse the more compact and less fragile portions of the rock."

In other words, the origin of an ore deposit cannot be inferred from its shape, because the shape is dependent upon structural conditions in the country-rock. The ore in veins occupies fractures that follow lines of least resistance, and those lines may be identical with the stratification. Selwyn continues: "In order to substantiate their origin by contemporaneous deposition at the surface, it would likewise require to be explained in a more satisfactory manner than has yet been done, why they are always found in close connection with anticlinal axes, and never at the outcrops of the main synclinal folds, or associated with strata which have not been subjected either to metamorphic agencies, or to folding or faulting." To which I may add that if the quartz had been deposited in a sheet-like layer, sandwiched between silt and sand, at the bottom of the ocean, or even in the flat discs characteristic of sedimentation, it would now be found wherever the quartzite and slate outcrop. Nor would we expect to find it particularly at the crest of the folds, for the pressure incidental to folding would have bent the beds in places where the least quartz offered the least opposition to plication, and not the places where the hard layer of quartz was thickest. But you would rather hear what else Selwyn has to say; he continues thus:

"The vein-like character of the quartz, the comparatively limited distances through which the layers have been traced, their more or less lenticular form, the evidences of motion in the enclosing rocks, the constant connection with anticlinal axes, and the absence of corresponding quartz layers through great thicknesses of strata which do not present evidences of such disturbance and corrugation, are circumstances, all of which are strongly opposed to the theory of contemporaneous deposits and as strongly in favour of the opposite conclusion."

As regards the granite of the Nova Scotian gold-mining region, Selwyn observes:

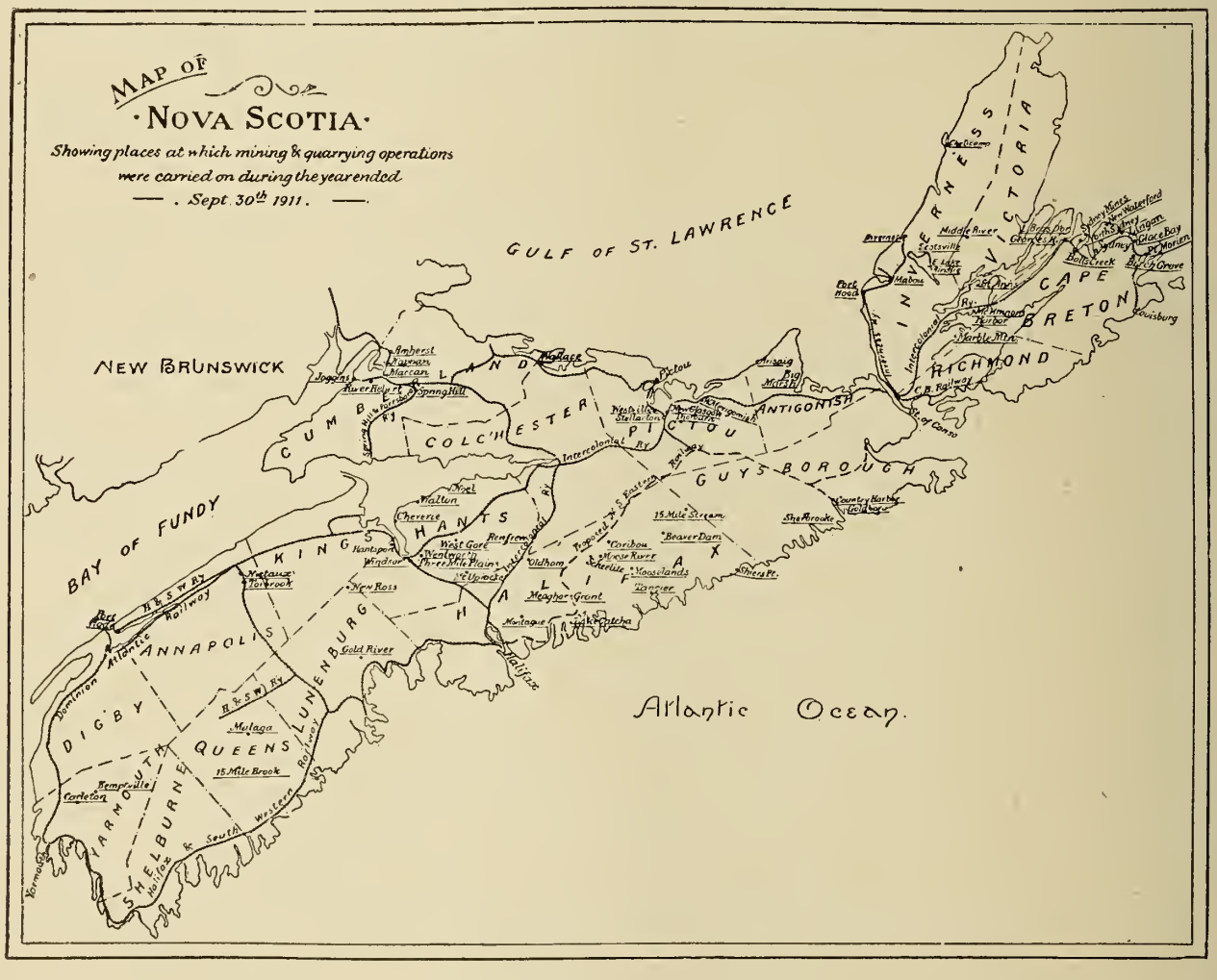
"It is strictly of an indigenous character, and neither an old granitoid gneissic series of Laurentian age, nor an intrusive mass. Dr. Dawson has shown ("Acadian Geology," 1868) that in different parts of its course it comes successively into contact with Lower Silurian, Upper Silurian, and Devonian rocks, and the manner in which these sedimentary strata are affected at the lines of contact scarcely leaves room to doubt the posterior origin of the granite. . . . The relations of the granite and kneissic rocks in Nova Scotia to the surrounding auriferous strata, are perfectly analogous to what is observed in this respect in the Australian gold districts, most of which are in close proximity to similar granitic centres. In one instance an auriferous quartz vein, which had been worked close up to the boundary of a large granitic area, was found to pass graudally, by the addition of feldspar and mica, into granite, losing its auriferous character and becoming a vein of ordinary grey granite exactly resembling the rock of the neighbouring granite mass, into which it eventually merged. It will be interesting to trace out the manner in which the quartz beds in Nova Scotia terminate in their strike toward the granite masses."

The comparison with Bendigo and Ballarat is just, as I can testify. The argument can be made stronger by reasoning that the branch or apophysis of granite that penetrated the quartzite and slate lost its mica and feldspar, gaining in quartz, until it became like an ordinary quartz vein, acquiring an "auriferous character," and becoming a vein of quartz "exactly resembling" the neighbouring anticlinal formations "into which it eventually merged." The differentiation from a dike of granite containing quartz, mica, and feldspar to a simple quartz vein, recalls the modern theory advanced by J. E. Spurr that some veins of silica or "alaskite" represent the last phase of magmatic segregation. Selwyn's question as regards the behaviour of the quartz veins when reaching the granite in their strike has been answered by mining operations that have followed such veins from the slate and quartzite into the granite. The quartz penetrates the granite and has been found gold-bearing, although not rich. The veins maintain their identity, but not for long, after entering the granite; and there is evidence to suggest that the quartz is an extreme phase of the silicification to which, in places, the granite itself has been subject.

A paper to be discussed at a meeting of the Institution of Mining and Metallurgy, held in the Rooms of the Geological Society, Burlington House, Picadilly, W. on Thursday, April 18th, 1912, at 8 O'Clock p.m. and presented at a meeting of the Canadian Mining Institute, at Toronto, on March 6th, 1912.

Coming to the barrel structure, Selwyn says:

"The facts which I have observed lead to the conclusion that the corrugation of the quartz is intimately connected with, and dependent on, the operations of the forces which have produced the slaty cleavage; the same forces have likewise, in all probability, caused the opening between the beds in which the quartz has been deposited; and also the great parallel east and west synclinal and anticlinal foldings of the strata. In every corrugated vein which I have examined, the axes of the corrugations or barrels always coincide with the strike of the cleavage. If the walls are of sandstone (whin), they are rarely corrugated, and seldom show any cleavage planes; though their surfaces, especially if in immediate contact with the quartz, frequently show ridges or parallel undulations, which strike with the cleavage and seem to have impressed


MAP OF
NOVA SCOTIA
Showing places at which mining & quarrying operations were carried on during the year ended
— . Sept. 30th 1911. —
GULF OF ST. LAWRENCE
NEW BRUNSWICK
BAY OF FUNDY
Atlantic Ocean.
CUMBERLAND
COLCHESTER
PICTOU
ANTIGONISH
GUYSBOROUGH
RICHMOND
CAPE BRETON
INVERNESS
VICTORIA
HANTS
KINGS
ANNAPOLIS
DIGBY
QUEENS
LUNENBURG
SHELBURNE
YARMOUTH
HALIFAX
Amherst
Maccan
Joggins
River Hebert
Springhill
Parrsboro
Pictou
Westville
New Glasgow
Stellarton
Antigonish
Port Hood
Mabou
Inverness
Broad Cove
Middle River
Baddeck
Whycocomagh
Sydney
Glace Bay
Louisburg
Sydney Mines
North Sydney
Bridgeport
Bell's Creek
Truro
Intercolonial Ry.
Windsor
Hantsport
Kentville
Wolfville
Canning
Port Williams
Nictaux
Torbrook
Middleton
Annapolis Royal
Port Royal
Bridgetown
Lawrencetown
Round Hill
Paradise
Granville Ferry
Clementsport
Digby
Weymouth
Yarmouth
Lockeport
Liverpool
Milton
Caledonia
Mahone Bay
Chester
Lunenburg
Bridgewater
Gold River
Windsor Junction
Elmsdale
Enfield
Shubenacadie
Maitland
Noel
Walton
Cheverie
Newport
Kennetcook
Hardwood Hill
Gays River
Stewiacke
Brookfield
Truro
Tatamagouche
Wallace
Malagash
Pugwash
Oxford
Westchester
Londonderry
Debert
Great Village
Economy
Parrsboro
Advocate
Joggins
Springhill
Amherst
Maccan
River Hebert
Port Greville
Apple River
Five Islands
Economy

of London, and again combated the old ideas of Hunt and Hind; for he said: "The theory that the 'leads,' as the lodes are locally called, are contemporary beds with the slates and quartzites has not since been generally accepted; nor has it gained ground with the further knowledge derived from working, nor been adopted by any of the miners, among whom are men experienced in other gold-producing countries."

* * * * *

In referring to the Waverley deposit, Poole says.

"In the overlying stratum the position of the plication in the quartz is marked merely by a moderate undulation. The quartz having yielded in the greatest degree to the lateral pressure would indicate that, at the time of the upheaval, it was then in a more plastic condition than the containing rocks, and the more when it is observed that the rolls contain angular fragments of slate, and send off shoots and tongues of quartz up into the superjacent stratum."

The notion that the extraordinary serpentine folds characterizing the 'barrel' structure must have been rendered posible by a plastic condition, assumed by the quartz by reason of excessive pressure, is not undeserving of respect; it affords one of the explanations most favoured by other geologists who came to Nova Scotia long after Poole; but it is rendered untenable by the evidence submitted by me in the first half of this paper.

John William Dawson.

Next we come to an authority of the first rank, John William Dawson, the chief of the Geological Survey of Canada. As early as 1878 he stated that "gold deposits seem richer in the vicinity of the granite," and at the same time he re-affirmed his view that "the granite intrusions and gold veins are roughly contemporaneous." In 1891, by which time he had been knighted, and was known as Sir William Dawson, he published 'The Geology of Nova Scotia, New Brunswick, and Prince Edward Island.' In that book he refers to the deposit of gold-bearing conglomerate at Gay's river, an occurrence important as affording evidence concerning the age of the gold deposits. He says:

"It was described in The Canadian Naturalist for 1864, by Mr. C. F. Hart, and Dr. Honeyman has favoured me with manuscript notes of a visit to the place in 1866. From these sources I extract the following information: The locality is at the junction of the Lower Carboniferous conglomerate with the slate and quartzite, forming the extremity of the ridge separating the valleys of the Stewiacke and Musquodoboit rivers. The slates belong to the Silurian gold-bearing formation, and contain small but rich auriferous quartz veins. The conglomerate is formed of the debris of these older rocks, and gold occurs in it exactly as in modern auriferous gravels, being found in the lower part of the conglomerate, and also in the hollows and crevices of the underlying slate. The fact is interesting, as showing that the gold veins existed in their present state at the beginning of the Carboniferous period, and that the causes which produced the modern gold alluvia were then in operation. By a later repetition of this process, the drift of boulder clay which overlies the conglomerate is at this place also slightly auriferous."

This is suggestive evidence. As Dawson says, a placer deposit was formed in the Carboniferous by the concentration of the debris eroded from the gold veins formed in the Silurian period, and in a long subsequent era the Carboniferous gravel, hardened to conglomerate, became degraded and distributed in the drift of the Glacial period, and this in turn is washed into the river-beds of to-day. Dawson calls the prevailing formation 'Silurian.' A generation ago it was the fashion to impute Silurian age to gold-bearing slates of unknown geological antiquity; this tendency is to be debited to the example of Sir Roderick Murchison, who ventured the rash prophecy that gold was confined to rocks of Silurian age. We may also demur to Dawson's assumption that because gold derived from the quartz veins is found in a Carboniferous conglomerate, that therefore "the gold veins existed in their present state at the beginning of the Carboniferous period." This is an assumption echoed by later observers, but it may well be questioned. All that the facts prove is that the gold in the superficial parts of the veins was in a condition similar to that in which it is found to-day in the outcrops, but the outcrop of a geological to-day is not the outcrop of a geological yesterday; the processes of nature do not rest in idleness; solution and precipitation, re-solution and re-precipitation are continually at work. It is not safe to assume that because gold is found now at two or three hundred feet below the surface that it existed there in its present state before several thousand feet of overlying rock was removed by erosion and denudation. That false assumption vitiates many of the theories of a much lower date.

Dawson quotes from notes made by him on a visit to Waverley in 1866. He says:

"The appearances showed that the barrel arrangement had constituted the crumpled crown of the anticlinal bend or arch—an explanation already given by Professor Silliman, and on one side the vein could be seen following the beds downwards on the side of this arch. The arrangement indicates great lateral pressure; and, which is of more importance, proves conclusively that the quartz veins are contemporaneous with the folding of the rock, since they have perfectly followed its folds without fracture. That the auriferous quartz beds are not veins is evident from the manner in which they send off branches into the neighbouring rock, as well as from their own crystalline structure and the character of the imbedded minerals. They are undoubtedly true veins, but not veins formed by fracture of the containing rocks when in a hard and a metamorphosed state. They have been formed and filled in the very act of the contortion and altering of the strata, and are thus of the nature of segregation veins, gradually formed as the spaces containing beds were bent without fracture and with but little crushing. The barrel quartz is most instructive as an illustration of this peculiar mode of formation, which must have occurred in the disturbance and metamorphism of sediments."

Here we have another reasonable theory. A sedimentary origin for the quartz is not entertained, but the folding of the quartz must have been contemporaneous with the regional plication that made the saddles and domes. The addition of segregation as a factor in the formation of these curious lodes aids the theory undoubtedly, but it is not convincing in the light of later evidence. Dawson says that "the quartz veins have perfectly followed the folds (in the rock) without fracture." This is not a fact. They do not follow the bedding-planes perfectly, but transgress

those lines of structure most palpably. Returning to the question of origin, he adds:

"No geologist who examines these veins can, I think, doubt their aqueous origin; but different opinions may be entertained as to the precise mode of introduction of the metallic minerals. The facts already stated . . . . appear to me to prove conclusively that the veins were formed at the time of the disturbance and alteration of the containing beds, and in consequence of the mechanical and chemical changes then in progress. In this case the gold and other metallic minerals were probably contained in a state of solution in alkaline sulphurets in the silica-bearing heated waters which penetrated the whole of the beds, and from which, as from a sponge, these silicious and metallic matters have been pressed out in the folding and contortion of the beds."

"Sulphurets" is used for sulphides. This old term still lingers in California. At one time it was employed to designate the sooty products of decomposition resulting in the early sulphatization of base-metal sulphides. However, this is by the way. The foregoing paragrpah of Dawson is but supplementary to the one preceding, and elaborates the theory on which I have already animadverted.

A newspaper report is to the effect that mining activity is general again throughout the coal fields of Eastern British Columbia and Southern Alberta. Production of coal in these districts is stated to now be nearly normal. Among the mines in the latter district, the International, at Coleman, is reported as shipping about 2,000 tons of coal daily and making some 500 tons into coke, while the McGillivray Creek Company's mine, a neighbouring property, is shipping about 400 tons daily.

Statistics for 1909, given in a Bluebook, prepared by the British chief inspector of mines, and issued last September, show that at the mines and quarries of the world, 6,004,928 persons were employed, and of these more than one-half were engaged in coal mining. Great Britain employed more than 997,000; the United States, 660,000; Germany, 688,000; France, 190,000; Russia (1908), 174,000; Belgium, 143,000; Austria, 134,000, and India more than 119,000. The coal produced was 1,113,308,386 metric tons, possessing a value estimated at nearly £400,000,000 sterling, or say two thousand million dollars. Production of the United States was more than 418,000,000 tons, while Great Britain was second, with more than 268,000,000 tons. Canada was

A new record for haulage ropes has been made on the French slope, Reserve Colliery, where the rope now in use has hauled over 500,000 tons. It is about 23,000 feet long.

THE CANADIAN H. W. JOHNS-MANVILLE COMPANY, LIMITED.

Increased business in the sale of J-M Asbestos, Magnesia and Electrical Supplies, throughout the territory covered by the Canadian H. W. Johns-Manville Company, Limited, at Winnipeg, has necessitated a move from its old quarters at 320 Main Street, to 89 Princess Street.

The new building will enable a much larger stock of goods to be carried on hand than heretofore. Mr. M. C. Burgess, who has been a resident of Winnipeg for many years and is well and favourably known in that section, has charge of this office, and under his supervision is a force of nineteen men.

THE CONSULTING ENGINEER.

The enlarged sale of operations which has taken place during the past decade and the amalgamations of large areas have undoubtedly reduced the field of the consulting engineer and metallurgist in general practice. Most of the great mining houses have their own staff of experts, who take the place of the formerly employed consultant. In the case of small companies and individuals there is too great a tendency to do without the services of the consulting engineer, which is due to ignorance and inexperience. No doubt much useless expenditure would be saved by employing consulting engineers, as no class of work lends itself to such big losses through faulty equipment and development as mining, and it pays to employ the best man to get the best work. We have seen many instances of this penny wise and pound foolish policy. A little knowledge of mining is a dangerous thing, and many really valuable properties have come to grief for the want of expert guidance in the initial stages. In America engineers insert their professional cards in the mining papers, a practice which should become much more prevalent, as it is a perfectly proper means of bringing their names before possible clients.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

.. **Dominion Coal Ouputs.**—Taking all things into consideration, the Dominion Coal Company had in April the best month in its history. The output was 379,612 tons. Divided by twenty-five working days this gives an average daily production of 15,180 tons. During the month the output for the first time crossed the 17,000 mark. The output for April of last year was 286,533 tons, and the best previous April production was obtained in 1907, when 316,384 tons were raised, so that the current year's figure exceeds the existing record by 63,000 tons.

The outputs of the individual collieries were as under:

	Tons.
No. 1	50,162
2	72,372
3	11,935
4	37,847
5	24,950
6	27,045
7	16,730
8	15,330
9	37,379
10	17,909

	Tons.
12	25,740
14	26,624
15	8,278
16	4,310
21	1,568
22	1,434
	379,612

Collieries Nos. 6, 2 and 14 established new records. No. 2 Colliery in particular did exceedinly well. This mine worked only 24 days, and produced a daily average of slightly more than 3,000 tons from the Phaen Seam and 1,500 tons from the Harbour Seam, or a combined total of 4,500 tons per day over the one bankhead. There are very few shaft mines in America which can do better than this, if any.

The output for the first four months of the year compares with previous years as under:

	Tons.
4 months ending April 30, 1908	1,249,535
4 months ending April 30, 1909	957,471
4 months ending April 30, 1910	899,250
4 months ending April 30, 1911	1,172,420
4 months ending April 30, 1912	1,344,000

It will be noticed that the 1908 figures, which up to the present year were the highest, were exceeded to the end of April by almost 100,000 tons.

The ice conditions along the coast were unusually favourable for shipping operations. Although there was as much if not more than the usual amount of ice in the Gulf and along the coast of Nova Scotia, it kept well out to sea, owing to the prevalence of northwesterly winds, and shipping was not hindered. The St. Lawrence opened for navigation about the 27th of April, and the first cargo from the mines left on that date. It is probable that the amount of coal which will be sent up the St. Lawrence from the Cape Breton and Nova Scotian mines during the ensuing season will far exceed anything in previous seasons. There will be some very fine steamers on the route. Both the Dominion Coal Company and the Nova Scotia Steel & Coal Company will have vessels of large carrying capacity—up to 10,000 tons and even greater—all self-trimmers and capable of being loaded and discharged with great rapidity.

The Dominion Coal Company is now beginning to feel the benefit of the large capital expenditure which has been in progress over a very long period—ten or twelve years in fact. Since the year 1900, the company has developed and equipped collieries Nos. 2, 3, 6, 9, 10, 12, 14 and 15, and have in course of development Nos. 16, 21 and 22. In addition, No. 1 Colliery was practically re-modelled after the fire in 1903, and No. 7 Colliery was entirely renewed after the fire in 1906. At all the other collieries arge additions have been made to the od equipment. In addition to this a very comprehensive scheme of electrification is approaching completion, and the appliances for preparation of the coal for the market have been improved and added to all around the collieries. Large sums have been spent on discharging plants at the St. Lawrence ports and at St. John and Halifax, on loading piers at Sydney and Loiusburg, and on railway branches and rolling stock in connection with the Sydney & Louisburg Railway. The expenditure on new collieries was required not only to meet the increased demands for coal, but to replace the diminishing output of some of the old collieries, and last year the company made the first decided advance in its annual output since the increase obtained in 1906. In 1912 an output of at least 4,250,000 tons may be expected, and with ordinary good fortune the annual production should advance to 4,500,000 in 1913. The potentialities of the Dominion Coal Company have often been enlarged upon, but it is difficult teoxaggergate them. When it is considered that this company controls absolutely for over seventy years to come the finest coal property in the Dominion, and the major portion of the only coalfield of any importance on the Atlantic seabord of the American continent, it is evident that the industry is even yet but in its infancy, and that the Dominion Coal Company will at some future date attain an importance as yet unthought of.

ONTARIO.

Porcupine, Swastika.

Owing to the fact that the heads on three out of four of the tube mills at the Dome mine have broken and that it must be some time before new castings can be made the output from the mill for the first month did not in any sense represent the practice of the mill under normal conditions. To date two gold bars have been shipped, one containing something over two thousand ounces from the plates and another about 1,800 ounces from the presses. During the first month of operation the mill only ran 414 hours and on an average only twenty of the forty stamps were dropped. Owing to the accidents to the tube mills, it is not likely that the mill will attain anything approaching capacity until June.

The McIntyre mill is producing steadiy. To the end of the week of May 11, seven gold bars will have been shipped, worth between $20,000 and $25,000, no official figures having been furnished. The management states that a contract has been let for the construction of a twenty-stamp mill which calls for the completion of the plant in 135 days, so that it should be in operation by September. The present 10-stamp mill has given such satisfactory results to date that the enlarged mill will be based upon the practice there obtaining, but the exact details have not yet been worked out. To date there is between 4,000 and 5,000 feet of work accomplished at the McIntyre mine. No. 1 and No. 4 shafts are down 220 feet and 240 feet respectively, and both show ore for the full width. A churn drill operating at the west end of Pearl Lake to discover the depth of bedrock struck a body of quartz at 130 feet. As it appears to be right on the strike of the Hollinger series of veins the discovery may develop something of importance. Now that the McIntyre has ample power fifteen drills are working and the vein at the No. 5 shaft is being drifted upon again. While recent developments have shown that McIntyre ore is not likely to be as high-grade as Hollinger there does appear to be a probability that a large body of medium grade ore will be developed and put in sight by the end of the year.

Developments at the McEaneny have been extremely propitious in the last month. At both levels remarkable ore is being drifted on. The vein which, though very rich, had been rather narrow till within the past week has widened considerably without showing much falling away in values. On the hundred-foot level 100 feet of ore has been developed, and on the 200-foot, 60 feet. The new electric hoist is now running and the plant is now one of the most complete and efficient in camp. The shaft is being rushed down to the 300-foot level with a view of opening up another level as soon as possible.

The Moneta Mining Company has run into a body of quartz at the 200-foot level containing sulphides, but the management of the mine has not as yet stated if the ore contains pay values. The Moneta is in the sand belt to the west of the Hollinger and hopes to get the extension of the Miller-Middleton vein.

There is to be no merger of the Hollinger, the Miller-Middleton and the Dixon properties for some years at any rate. It is felt that it would be prejudicial to the interests of Hollinger shareholders to link a developed mine as the Hollinger is today with two prospects, very promising it is true, but still prospects, and it is therefore very likely that one or other of the Timmins-McMartin-Dunlap holdings will be floated as separ-

ate companies. A report recently made on the Miller-Middleton shows that while that property has a prospect of a large body of milling ore it is by no means in the same category as a mine with the Hollinger.

Working under Pearl Lake at the 200-foot level the Plenaurum is still meeting with considerable success. The big vein at No. 1 shaft has just been cut and shows nine feet of quartz, all pay ore. The cross-cut that opened up this vein will be continued to catch the extension of the Jupiter. Another vein has been cut in No. 2 shaft, and altogether at the 200-foot level the Plenaurum has five veins from which it is probable that ore can be mined and milled at a profit.

Some specimens, remarkable for the coarse gold to be seen in them, have been taken from the drift at the 100-foot level of the Three Nations Lake, the ore being encountered 30 feet from the shaft. The gold is associated with galena in narrow quartz seams.

The management of the Hughes Porcupine property has been taken over by Mr. Ernest H. York, whose last charge was the Calcite Lake mine near Gowganda. Mr. Mowery Bates is the retiring manager. It is understood that the Hughes will at once set up the compressor that has for some time been on the property.

The management of the Dome Lake mine give out the statement that the two and a half tons of ore sent down from a mill run to the Kingston School of Mines returned an average assay of $42. The Dome Lake has decided to build a 10-stamp mill and has ordered a 10-drill compressor and boilers.

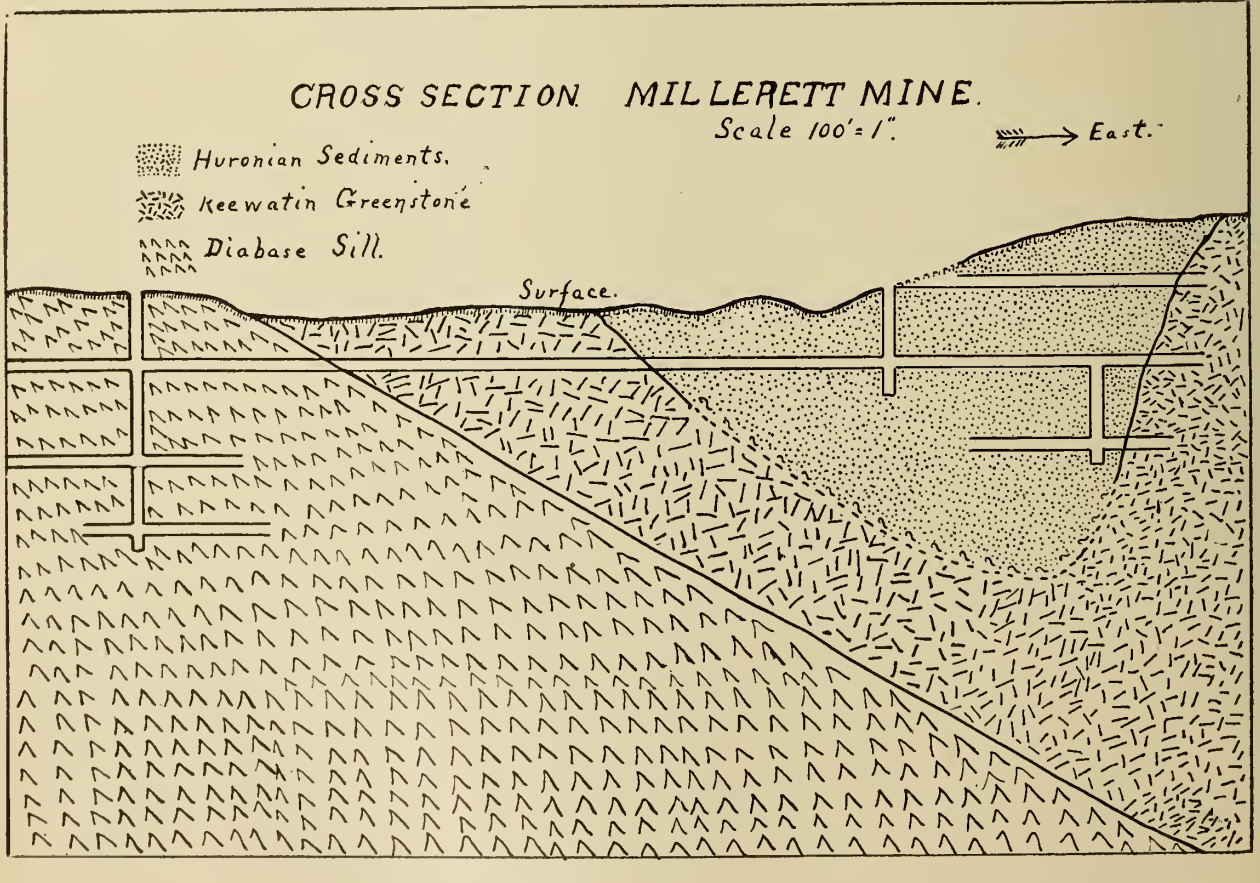
The final payment on the Davidson property has been made by the Crown Chartered Company, and the latter company is now sole owner of the property, where developments are still favourable.

The annual meeting of the Rea ousted the president, C. P. Hill, from the presidency, and appointed an entirely new board of management. The financial statement showed that development money was exhausted, but that the company had no debts. The manager showed a number of plans showing the development work, but declined to make any estimate of the tonnage or grade of ore in sight. The newly-elected directors are A. C. McMaster, Toronto; M. Doheny, Montreal; W. A. Mitchell, Toronto; W. H. Jackson, Toronto; James Wright, Chicago; Henry Lockhart, New York, and T. H. Rea, Toronto.

Cobalt, Gowganda and South Lorrain.

Before the Cobalt branch of the Canadian Mining Institute, Prof. G. R. Mickle, provincial mine assessor, read a very valuable paper on the total production of the Cobalt camp. Prof. Mickle has opportuuities in his o..cial position to correctly estimate the ore in sight and likely to be put in sight which no other one man possesses. By a process of deduction he showed that 56 per cent. of the silver had been mined and marketed from the known productive veins, which were 111 in number. The amount of silver produced from these veins to July of last year, was 107,800,000 ounces and 8,000,000 ounces on the dumps would bring the total up to 115,800,000 ounces. Proceeding, the speaker showed that according to the percentage of good ground not yet prospected or adequately prospected, 21 more productive veins ought to be found. From these new veins 35 million ounces should be extracted, which with the 46 per cent. of the silver yet to be mined and marketed from the known veins would give a total production from the camp of 242,000,000 ounces. Estimating that 25,000,000 ounces had been produced since July it would be seen that at the end of April there was 101,200,000 yet to be extracted from Cobalt veins. Of the 111 producing veins 86 were in the Huronian, 12 in the diabase, and 13 in the Keewatin. The estimate was made for Cobalt proper and does not include South Lorrain, Elk Lake or Gowganda.

At the annual meeting of the La Rose Mining Company the following new names were added to the directorate: E. W. Nesbitt, of Woodstock; Edwin Hanson, Montreal, and W. M. Dobell, Quebec. These gentlemen take the place of E. P. Earle, Richard T. Greene, and David Fasken. As the company is now a Canadian corporation the headquarters of it have been removed from New York to Montreal.



Under the managemeut of Mr. M. B. R. Gordon, acting for Sir Henry Pellatt and associates, work has beeu resumed at the Ophir mine. In the same section the John Black has also opened up again. Other non-producers that have resuued or expect to resume are the Twentieth Century, the Silver Queen, the Jajola and several others.

The shipments from the outside silver districts of South Lorrain and Gowganda were Mann, 20.00, Millerett 20.00, from Gowganda aud 73.22 from the Wettlaufer in South Lorraiu.

The Nipissing statement for the end of March was cash on hand, $1,091,826, ore in transit and at smelters $254,836, ore sacked ready for shipmeut $203,650, total $1,550,412.

BRITISH COLUMBIA.

As the spring advances there is increased activity iu connection with mining in the province. In the larger placer mining districts—Cariboo and Atlin—preparations are being made for what is hoped will prove a long season's run. In smaller degree there will also be activity on some of the gold-bearing streams in East Kootenay, Big Bend of the Columbia (in Revelstoke mining division), Similkameen, and Omineca.

The outlook for lode mining is distinctly encouraging on the whole. Lead in East Kootenay, silver and lead in Aiusworth and Slocan, gold and lead in in Nelson, gold and copper in Rossland, copper with gold and silver in association in Bouudary. Gold and copper in Similkameen, aud gold and copper in the Coast district, are the chief metals that will be produced.

Coal mining may be expected to be on a large scale than in any previous year. This expectation covers all three coal-producing districts of the province, namely Vancouver Island, Nicola Valley and Similkameen, and the Crow's Nest.

Cariboo.—In Quesnel mining division the gravel-washing season has been opened by the Quesnelle Hydraulic Gold Mining Company, which commenced piping on April 15th—at least a month earlier than is customary in Cariboo district. High carbon steel plates and manganese steel rails have been placed in the sluiceways. During the winter 85 tons of plates and 25 tons of rails were hauled from the Canadian Pacific Railway at Ashcroft to the mine, and these were placed in position in the sluices by the early part of April. These 40-lb. steel rails will, it is expected, last at least ten times as long as the ordiuary Bessemer steel rails. The steel pates are 58 inches square, and their carbon content varies from 0.80 to 1.20 per cent. In the sluice bed they are spaced two inches apart and each plate is placed half-an-inch lower than the preceding one, it having been found that this arrangemeut reduces the wear at the end of the plates. The rails have been put in for 200 feet of the sluiceway; eventually a total length of 300 feet will be reached, the railed part of the sluiceway being lengthened as required. The company's water system covers a distance of approximatey 25 miles from dam on Swift River to dump ou Quesnel River. An important feature is that it includes three iuverted siphons of 5 feet inside diameter and aggregating 9,000 feet in length, having a capacity of 60,000,000 gallons of water every 24 hours.

Slocan.—Constructiou work on the branch railway line from Three Forks to Bear Lake has been resumed, and it is hoped that this line will be available for hauling ore from the Rambler-Cariboo and Lucky Jim mines before the summer shall have passed.

Included in the mining news published in district newspapers are many notes indicating progress, and promise of extended operations and enlarged production. Shipment of ore and concentrates from mines in Four-mile camp, near Silverton, is being well maintained. About Sandon much mining work is being done. The low-level tunnel on the Slocan Star group is in about 900 feet, and in the old workings above developments are encouraging for finding more ore. Above Cody several properties are being worked, and of these the Twilight, Reco, and Noble Five should soon ship ore. The deep development work on the Payne, situated about two miles from Sandon, is being proceeded with, fair progress being made in driving the long cross-cut tunnel. The erection of a new concentrator building for the Rambler-Cariboo and removal of mill equipment from the old mill to the new, will be undertaken as soon as it can be done with advantage; also construction of an aerial tramway from the portal of the low-level tunnel of the mine down to the mill site alongside the new railway. Development of the Rambler-Cariboo Extended, and the Rio, is being continued. The finding of a shoot of good ore in the latter has been reported.

Farther east, shipment of zinc ore from the Lucky Jim mine will be made immediately after railway transportation shall have been provided. Further development of the upper levels of the Whitewater outcrop mine is being done by Retallck & Company, while the Utica will ship ore to the extent railway facilities will admit.

The Consolidated Mining and Smelting Company, beside working No. 1 mine, in Ainsworth camp, has bonded the Highland, situated a short distance higher up Kootenay Lake than the town of Ainsworth. The Mabry syndicate is still giving this camp attention, while across the lake the Blue Bell is being worked with a gradually increasing number of men employed. Other properties in various parts of the district are also employing more or less men, so that taken altogether there appears to be good reason to expect that more mining and greater production will mark the year 1912, probably, than in any previous year.

Le Roi Mining Company.—The London correspondent of the Vancouver Daily Province, writing on April 5th, included the following in his letter: ''Mr. A. J. McMillan presided at a meeting held here of the Le Roi Mining Company, when he presented the accounts in connection with the liquidation of the company, covering the period from September 2nd, 1910, to March 2nd, 1912. Having mentioned the salient features in the liquidation, he said he had often been asked what return would finally be made to the shareholders. It was difficult to answer the question exactly. They had already made a return of two shillings per share, the cash in hand was equivalent to about one shilling per share, and the further sum to be received on account of the sale of the mine, amounting to £25,000 or thereabouts, was equal to something over two shillings per share. At the present time he was endeavouring to effect the sale of the smeltery. If this sal should go through it might mean another shilling, or one shilling and six pence for the shareholders. The accounts were agreed to without comment from the shareholders.''

Hedley, Similkameen.—A few weeks ago the Hedley Gazette published the following information: ''The mining outlook for Camp Hedley in 1912 looks better than it has done for years. In addition to the Kingston, the Apex, and in all probability the Oregon, there are negotiations now afoot which indicate the bonding of some more likely ground in the immediate vicinity.'' On April 25th, the same useful local newspaper stated that ''some prospecting outfits have been seen in Hedley during the past week. There is no part of the province that offers better encouragement to those pioneers of industry who have added so much to the country's wealth than the hills overlooking the Similkameen River.''

From the Gazette it is also learned that the Hedley Gold Mining Company crushed 6,263 tons of ore at its 40-stamp mill during March. The highest previous monthly record was that for December, 1911, of 5,514 tons. It may be noted that the figures for March, given above, show that the estimate of 6,247 tons for that month, printed in the Canadian Mining Journal of April 15th, was rather under the quantity actually milled, so that the estimate of profit for the quarter ended March 31st, placed at $76,676, is not likely to prove too high.

Boundary.—Boundary district newspapers lately published information to the effect that another big blast had been fired at the British Columbia Copper Company's Mother Lode mine, near Greenwood. Summarized, the facts are that 2,200 holes were charged with about 10 tons of explosive and, approximately, 100,000 tons of ore was broken down. The following brief account of a similar occurrence last autumn will better indicate the nature and effects of this method of breaking down ore, the conditions being much the same on both occasions:

''The most important work done in the British Columbia Copper Company's mine in 1911 was in connection with the method of breaking down and extracting ore inaugurated in the Mother Lode mine the previous year by Mr. E. Hibbert, mine superintendent, and continued in 1911. This consisted of dividing the orebody into a series of transverse stopes of a maximum width of 25 feet and breaking the ore down in large quantities. An idea of the extent of these stopes may be obtained from the following brief particulars of one blast, in preparing for which 2,433 holes, averaging approximately 14 feet each in depth, were drilled. The explosive charge consisted of 425 boxes of 40 per cent. dynamite (equal to 10⅝ tons), and 2,525 electric detonators, low tension No. 7, were used. Connection was finally made to a 550-volt circuit. The result of this blast was to break down more than 100,000 tons of ore.''

GENERAL MINING NEWS

NOVA SCOTIA.

Halifax.—Unable to procure a supply of coal in Great Britain, the Shaw Saville and Albion Liner Tokomaru was forced to cross the Atlantic for a cargo for Cape Town and last week loaded at the Scotia piers in North Sydney. In addition, she also took sufficient bunkers to last her on a fifteen thousand mile voyage to New Zealand and sailed Saturday for Tenerific on the first stage of her long trip to the Antipodes. Since the beginning of the strike at the British collieries, Cape Breton coal has gone to many quarters of the globe, but the present shipment, or part of it, is probably traversing a longer distance than any previous cargoes. Not since the British strike of 1873, when Nova Scotia collieries shipped coal to the Philippines and the East Indies, has there been anything like the amount of export trade carried on by the larger Nova Scotian companies that has marked the past three or four months. In addition to other business, the Scotia Company captured a con-

tract said to be for over thirty thousand tons in Uruguay, while the Dominion Coal Company has also sent a large tonnage to many foreign ports. Montevideo, Cape Verde, Rio de Janiero, the West Indies, and many European ports have drawn on the two big Cape Breton Companies, and a cargo has gone to London.

QUEBEC.

Montreal.—Plant for the future of the Amalgamated Asbestos Corporation under the reorganization scheme are being rapidly worked out under the direction of the general bondholders' committee. It is understood that Mr. W. G. Ross, formerly managing director of the Montreal Street Railway, will take the presidency of the new company, but it is not likely the appointment will be formally made for a few weeks. As was generally expected the name of the company will be changed, taking the title of the Asbestos Corporation of Canada. Mr. Ross is widely known in financial circles as a successful organizer and administrator, and it is believed that the future of the Asbestos Corporation could not be placed in better hands. He went abroad after his resignation from the street railway management about a year and a half ago and took a long rest. Since his return a few months ago he has been engaged in looking after his private affairs, but it was regarded as a certainty that sooner or later his business ability would be turned to account in connection with some of the large industries of the country. It is learned that the $7,000,000 capitalization will be divided as follows: $3,000,000 1st mortgage 40-year 5 p.c. bonds; $4,000,000 6 p. c. preferred participating with the common after latter has received 5 p. c. dividends; $3,000,000 common stock. For each $1,000 Amalgamated Asbestos bonds the holder will be given $250 in new bonds, $500 preferred and $250 common stock. Bondholders may subscribe to new bonds to extent of 6¼ per cent. of par value of present holdings. Preferred shareholders of Amalgamated Asbestos may subscribe to new bonds to extent of 20 per cent. of par value of present holdings, terms of subscriptions in each case being 85 per cent. for the bonds together with 100 per cent. bonus or common stock. There will be seven directors of the new corporation—five will be W. G. Ross, H. J. Fuller and Wm. Macmaster, of Montreal; Uzal H. McCarter, of Newark, N.J., and H. E. Mitchell, of Philadelphia. The remaining two are to be named by the English committee.

ONTARIO.

Toronto, May 2.—At the annual meeting of the Dobie Mines, held here yesterday, the financial statement showed the company to have on hand in cash $48,699, and in stores, etc., something like $2,000 more. Ther are in the treasury also 59,995 shares. The report did not make reference to the claims put into the Dobie treasury by Messrs. Armstrong and McGibbon. These properties will probably be fully prospected this summer. The old directors were re-elected.

Elk Lake, May 9.—The Syracuse Mining Company is letting a contract for 100 feet of sinking on its property in Tudhope Township. There is a shaft already sunk on this property to the depths of 100 feet and the present contract will reach the 208-foot level. This will make the 10th property resuming active work in the Elk Lake district.

COMPANY NOTES

BEAVER CONSOLIDATED.

The annual report submitted by the directors of the Beaver Consolidated Mines Company, covering a period ending February 29, 1912, shows gross earnings of $223,098, out of which dividends amounting to $169,912 were paid, while $20,293 was written off for depreciation.

The net value of the ore shipped amounted to $385,513. The report shows that the mill with its present equipment will handle from 50 to 60 tons of ore per day, and the machinery in hand is of such a character that with an additional expenditure of $5,000 the capacity of the plant can be brought up to 100 tons per day. The mill to date, together with the tramway and pipe line to the lake, has cost $48,000, and is all paid for. Development work during the year amounted to 3,514 feet.

President F. L. Culvert, in his report, states in part:

"There are now eight levels on the property. The main shaft is down to a depth of 548 feet. On the 400-foot level the ore chute has been reached with splendid results. On the 460-foot level we have crosscut to the vein and are driving on it toward the ore chute, and believe the same good results will be obtained as on the levels above. The station has been cut at 530 feet and a crosscut is being driven to the vein. Sinking on the main shaft will soon be resumed and continued to a depth of 600 feet, where the next station will be cut.

"Owing to the erratic nature of the veins in the Cobalt camp, it is hardly advisable to undertake to give an estimate of ore in sight. At the best it would be only guess-work, but the persistency with which new ore chutes of very rich values are being encountered would make it appear that the property has a long, prosperous life before it. Up to the present time only about five acres have been prospected.

"The company did not go on a regular dividend-paying basis last year, but distributed 8½ per cent. on the capitalization, or nearly $170,000, to the shareholders. We believe the year 1912 has much greater prospects than the year just closed. Having to-day one of the most efficient working plants in the Cobalt camp, and excellent ore showings, it would seem that larger distribution in the way of dividends may be made to the shareholders, but the directors are of the opinion that a substantial cash surplus should be accumulated and the mill be operated for a reasonable time before definitely placing the company on a regular quarterly dividend basis.

"The company has now cash in hand and in bank amounting to $84,484, and there is ore in transit or at the smelters amounting to $76,504. This, together with accounts receivable and supplies on hand, gives the company a net cash working balance of $170,170."

TEMISKAMING QUARTERLY DIVIDEND.

A quarterly statement issued by the Temiskaming directors says:

The total production of silver for the quarter was 562,910 ounces, of which amount 305,557 were obtained by hand-sorting, and 257,353 were saved at the mill.

The cost of production covering every charge was 16¼ cents per ounce.

Though no new discoveries of moment have been made, some of the known deposits at the various levels are opening up splendidly, promising well for continued good production.

The company's statement is as follows:

Cash in banks	$289,577
Owing from smelters	182,369
Ore on hand	11,995
Accounts receivable and stocks on hand	512,445
Less March pay roll and accounts payable	28,225
	$484,219
Less balance of deferred payments for North Dome Mining Co., Limited, stock	175,000
Balance	$309,219

BRITISH COLUMBIA COPPER COMPANY.

The situation at the British Columbia Copper Company has changed within the past few months. The company is now operating again under normal conditions after a period in which operations were greatly handicapped, due to a coke strike at Crow's Nest Pass, during which period the company was required to purchase Eastern coke at an exorbitant price laid down at Greenwood. At the present time the plant is operating to capacity, all furnaces being in commission. Over 2,000 tons of ore per day are being handled, of which approximately 500 tons are coming from the New Dominion property. Preliminary earnings for March on the 1,050,000 lbs. produced have been placed at $57,000. It is now believed, owing to the higher metal price indicated for April over that used as a basis of calculation, that these profits will be increased by approximately $10,000, making the final figure around $67,000. It may be said that these figures represent the largest monthly earnings ever made by the British Columbia Company. The new Voight property, located near Princeton, which the British Columbia Company now has under option, is developing particularly well, and the management are very much encouraged with the results so far obtained. The property contains a large territory, but up to the present time development has been confined to but two claims, numbers fourteen and eighteen. The surface showing at the property consists of a highly silicious zone. Since taking the Voight property under option, state Thompson, Towle & Company, a shaft has been sunk 90 feet and drifting begun. At about 75 feet from shaft this drift cut a distinct vein of high grade ore 8 feet wide. At this point the ore asayed $11 in gold and 8 per cent. copper. Further opening up of the lode has indicated an average for all of the samples of more than 3½ per cent. copper and $3.50 gold. The ore is basic in character, containing a heavy excess of iron and lime and high in sulphur. It is the intention to ship these ores to the British Columbia's Greenwood smelter.

GRANBY CONSOLIDATED.

The advance in Granby has been due to no particular new development beyond the fact that a sustained 16c. copper market will permit Granby showing earnings of $9 per share on its present basis of operations. The Granby facts have been clearly shown in recent bulletins that have been issued from time to time. In fact, last February, when copper was selling around 14c., it was stated: "If a 14c. price for copper can be maintained until summer, Granby may not have to do any new financing for its Hidden Creek property. The Granby from its Phoenix properties can earn $75,000 per month, possibly more, with the present price of copper, and the company should earn $500,000 before the Hidden Creek property is in commission. In other words, the profits from its Boundary operations can finance Hidden Creek developments and smelter construction, and thereafter with two smelters in operation it is figured that Granby will be able to produce between 4,000,000 and 5,000,000 lbs. copper per month, which would permit of very handsome earnings on its 150,000 shares stock."

It is officially stated that construction of the new 2,000-ton smelter will start on May 1st, which will involve an expenditure of $1,000,000, and it may require $1,000,000 more to place the property in shape for production, and while some of the Granby interests have been very desirous of placing the Hidden Creek property on a productive basis without the issue of any new securities, it may be decided to do some new financing, although this has not yet been definitely determined.

WETTLAUFER COMPANY.

At the annual meeting of the Wettlaufer mine of Cobalt, Ont., it was shown that the company shipped 925,017 ounces of silver during the year, giving a total receipt of $481,368. During the twelve months, 2,179 feet of development work was accomplished and some excellent values were encountered in various parts of the workings.

The production, development, administration and expenses for the year were $167,977, leaving a profit for the year of $313,390. Out of this amount dividends amounting to $212,488 were paid, leaving a surplus of $100,902. The previous surplus on the books of the company was $121,908, making a total on December 31st of $222,810.

The general balance sheet of December 31st, 1911, shows assets as follows: Mine property, $1,382,602; plant and machinery, $36,964; buildings, $17,061; ore in hand and in transit, $92,430; inventory, $12,105; accounts receivable, etc., $1,075; cash on hand, $128,279, or a total of $1,671,518. The liabilities were: Capital stock, $1,416,590; accounts payable, $22,087; reserve for taxes, etc., $10,030; profit and loss surplus, $222,810.

President Harry Lockhart, in his report to the shareholders says in part: "The underground development during the year has been satisfactory and the policy inaugurated during the past year of keeping reserves well ahead of extraction will be continued. The discovery of a new ore body on the fourth level has added materially to the value of the property." General Manager Halstead Lindsley places the ore reserves at 1,003,000 ounces, and in his report says: "There were shipped 925,017 ounces during the year and 2,179 feet of development work was accomplished. The positive ore reserves are estimated to contain 1,003,000 ounces. No estimate of probable ore has been attempted, but it is likely that development in the new ore body will materially increase the reserves within the near future."

The directors made the announcement at the meeting that quarterly reports would be issued to the shareholders in future.

STATISTICS AND RETURNS

B. C. ORE SHIPMENTS.

The shipments to the Trail smelter are over 1,000 tons heavier this week (ending May 4th) than last. The Trail smelter passed the 100,000 ton mark, the B. C. Copper Company the 200,000 ton and the Granby the 400,000 ton.

The Granby blister copper shipments were 440,000 pounds, making 7,458,500 pounds for the year to date.

In some districts the roads are clearing up, as evidenced by the resumption of shipments by the Rambler-Cariboo and the Silver Cup. Leasers made shipments from the S. & F. at Rossland and the Molly Hughes at New Denver. The Standard and

Molly Gibson both shipped a heavier tonnage than for some time past.

Ore production and shipments to Consolidated:

	Shipments For week.	Shipments To Date.
Rossland—		
Centre Star	3,673	54,877
Le Roi	1,088	16,542
Le Roi No. 2	735	10,635
Bluebird	....	57
I. X. L.	12	12
East Kootenay—		
Sullivan	365	9,303
St. Eugene	....	401
Society Girl	....	21
Ainsworth—		
Utica	....	132
No. 1	....	330
Silver Cup (Lardo)	31	117
Monarch (Field)	32	208
Foreign—		
Knob Hill	151	1,401
Hope	....	20
Northport	....	34
Bonanza	....	80
Halley	....	30
Total	6,633	102,697
Granby	23,469	414,099
Slocan—		
Standard	309	3,261
Van Roi	31	1,261
Hewitt	....	90
Ottawa	....	28
Eastmount	....	51
Fidelity	....	61
Apex	....	36
Richmond-Eureka	....	7,473
Rambler-Cariboo	34	445
Reco	....	24
Lone Batchelor	....	31
Ruth	....	259
Middleton	....	24
Molly Hughes	7	7
Other mines	....	228
Nelson—		
Canadian King	....	54
Arlington	....	670
Nugget	....	44
Granite-Poorman	....	100
Queen	....	100
Emerald	....	853
Vancouver	....	17
Devlin	....	11
Molly Gibson	165	753

	Shipments For Week.	Shipments To Date.
B. C. Copper Company—		
Motherlode	5,750	134,396
Rawhide	5,709	58,714
Emma	....	4,650
Athelstan	....	357
Jackpot	408	6,274
Unnamed	416	2,943
Total	12,283	207,734

COBALT ORE SHIPMENTS.

Fourteen mines shipped ore from Cobalt for the week ending May 4th, establishing a record for the year. The total shipments were 22 cars, 17 of which were high grade.

The total shipments for the week were 1,427,549 pounds, or 713 tons.

The shipments for the week and year (in pounds of ore) were:

	Week.	Year.
Beaver	66,700	250,658
Buffalo	62,782	886,354
Can. Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers-Ferland	63,300	323,500
City of Cobalt	.....	291,712
Cobalt Lake	80,509	351,189
Cobalt Townsite	104,900	863,994
Colonial	.....	40,000
Coniagas	242,600	1,471,376
Crown Reserve	.....	382,204
Drummond	.....	604,000
Hudson Bay	.....	500,979
Kerr Lake	123,733	617,015
La Rose	152,705	2,424,660
Mann (Gowganda)	.....	40,000
McKinley	71,136	1,932,878
Millerett	.....	156,000
Miller Lake-O'Brien	.....	146,500
Nipissing	147,509	1,496,495
O'Brien	63,865	462,835
Provincial	.....	44,440
Temiskaming	120,528	685,097
Right of Way	76,600	296,896
Trethewey	54,364	326,999
Wettlaufer	.....	216,470

DOMINION STEEL.

The April output of the Dominion Steel Company was: Coke, 42,495 tons; pig iron, 25,610; steel ingots, 29,710; blooms, 24,915; rails, 15,980; rods, 3,963; total shipments 17,585. The output at the Sulphate of Ammonia plant was 485 tons, a record, the best previous being 468 tons.

SHARE MARKET

(Courtesy of J. P. Bickell and Company, Standard Bank Building.)

May 8th.

New York Curb.

	Bid	Ask
Braden	5⅜	5½
B. C. Copper	5	5⅜
Bute Coal	No Market.	
Giroux	5½	5⅝
Greene-Cananea	8⅝	8¾
Inspiration	8½	8¾
Yukon Gold	3⅜	3½

	Bid	Ask
Goldfield Cons.	4	4⅛
Nevada Cons.	21⅛	21⅜
Miami	24⅝	25
Ray Cons.	18½	18⅞
Chino	28⅝	28⅞
United Copper.	1	1 3/16

Cobalt Stocks.

	Sales. Low	High
Bailey	.01¾	.02⅛
Beaver Consolidated	.45	.46½
Buffalo.	1.20	1.25
Chambers-Ferland.	.15½	.18
City of Cobalt	.15	.18
Cobalt Lake	.25¾	.27
Coniagas.	7.00	.....
Crown Reserve	3.10	3.25
Greath Northern	.11½	.13
Gould.	.02½	.03
Gifford.	.03	.04½
Green-Meehan.	.01⅜	.01¾
Hargraves.	.05	.07
Kerr Lake	2.75	2.85
La Rose	3.55	3.90
McKinley-Daragh	1.69	1.70
Nipissing.	7.70	7.90
Nova Scotia.	.01½	.04
Ophir.	.11	.12
Otisse.	.01⅜	.01¾
Peterson	.....	.....
Right of Way	.10	.12
Silver Leaf.	.03½	.05
Silver Queen.	.02	.04
Temiskaming.	.38½	.39½
Tretheway.	.54	.57
Wettlaufer.	.65	.67

Porcupine Stocks.

	Sales. Low	High
Apex.	.03½	.05
Dobie	.50	.75
Crown Chartered	.25½	.26
Dome Extension	.52	.52½
Eldorado.	.04	.06
Foley-O'Brien.	.18	.22
Hollinger.	.12	.12½
Jupiter.	.35½	.37
Moneta.	.14	.15
Nor. Ontario Exp.	.02½	.04
North Dome	.50	1.00
Pearl Lake	.17	.20
Porcupine Imperial	.04	.05
Porcupine Central	.70	1.00
Porcupine Northern	.15	.35
Porcupine Tisdale	.03¼	.03½
Porcupine Southern	.10	.25
Preston East Dome	.06	.07
Rea Mines.	.55	.70
Standard	.03	.04
Swastika	.20	.21
Vipond	.39	.41
United.	.01¾	.02½
West Dome	.15	.25
American Goldfields	No Market.	

Sundry.

	Low	High
Island Smelters.	.10	.10¾
Canadian Marconi.	7.40	7.80

TORONTO MARKETS.

May 9 (Quotations from Canada Metal Co., Toronto)—
Spelter, 6.50 cents per lb.
Lead, 4.50 cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 47 cents per lb.
Copper, casting, 16.25 cents per lb.
Electrolytic, 16.25 cents per lb.
Ingot Brass, 7 to 12 cents per lb.

May 9—Pig Iron (Quotations from Drummond, McCall & Co., Toronto)—
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, 22.50 (f.o.b. Toronto).
Midland No. 1, $19.75 to $20.50 (f.o.b. Toronto).
Midland No. 2, $19.75 to $20.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

May 7—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $2.40 to $2.50 per ton.
Foundry coke, prompt, $2.75 per ton.
May 7—Tin, Straits, 45.70 cents.
Copper, Prime Lake, 15.85 cents.
Electrolytic Copper, 15.75 cents.
Copper wire, 17.00 cents.
Lead, 4.20 cents.
Spelter, 6.85 cents.
Sheet zinc (f.o.b. spelter), 8.65 cents.
Antimony, Cookson's, 8.00 cents.
Aluminum, 19.50 to 20.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $41.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
April 23	59⅝	27 7/16
April 24	60½	27⅞
April 25	60⅜	27 13/16
April 26	60¾	28
April 27	60⅜	27 13/16
April 29	60⅝	27 13/16
April 30	61¼	28 3/16
May 1	61¼	28 3/16
May 2	61	28⅛
May 3	60⅞	28 1/16
May 4	60⅝	27 15/16
May 6	60⅛	27 11/16
May 7	60¼	27¾

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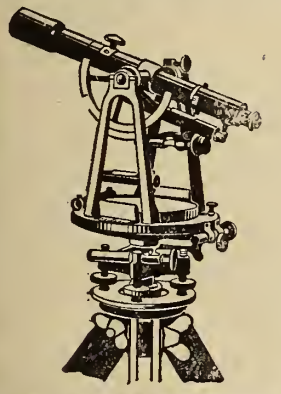

BUFF Mining Transits and Levels

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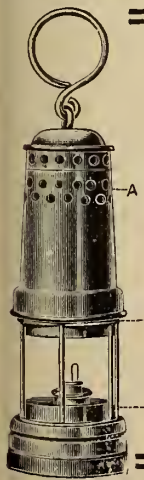

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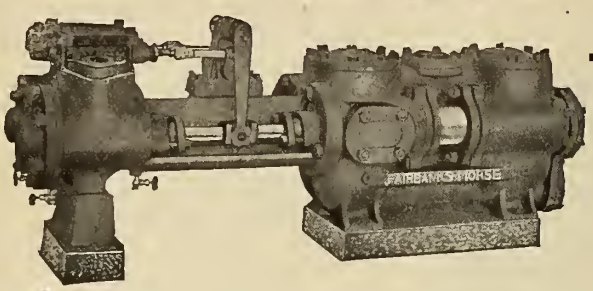

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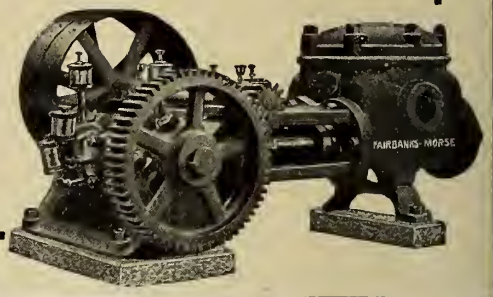

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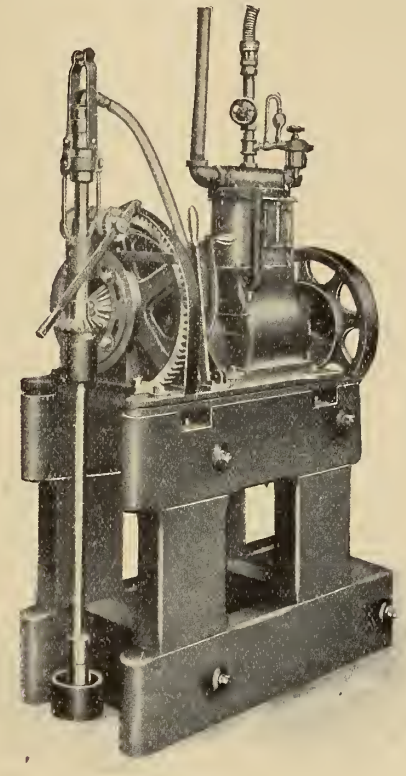

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For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

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PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.

Nova Scotia Mines

Gold, Coal, Iron, Copper, Lead, Tin, Manganese, Tungsten, and other minerals.

The Gold District covers more than three thousand square miles. Millions of dollars worth of gold have been taken from the gold fields of Nova Scotia and millions of dollars worth remain for recovery.

Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. W. H. HEARST,

Minister of Lands, Forests and Mines,

Toronto, Canada.

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Jenckes Machine Co.
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Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
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Jenckes Machine Co.
Peacock Bros.
Engines—Steam—
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Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
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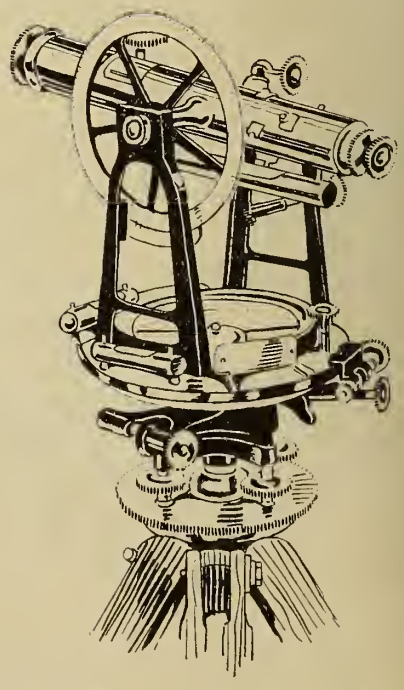

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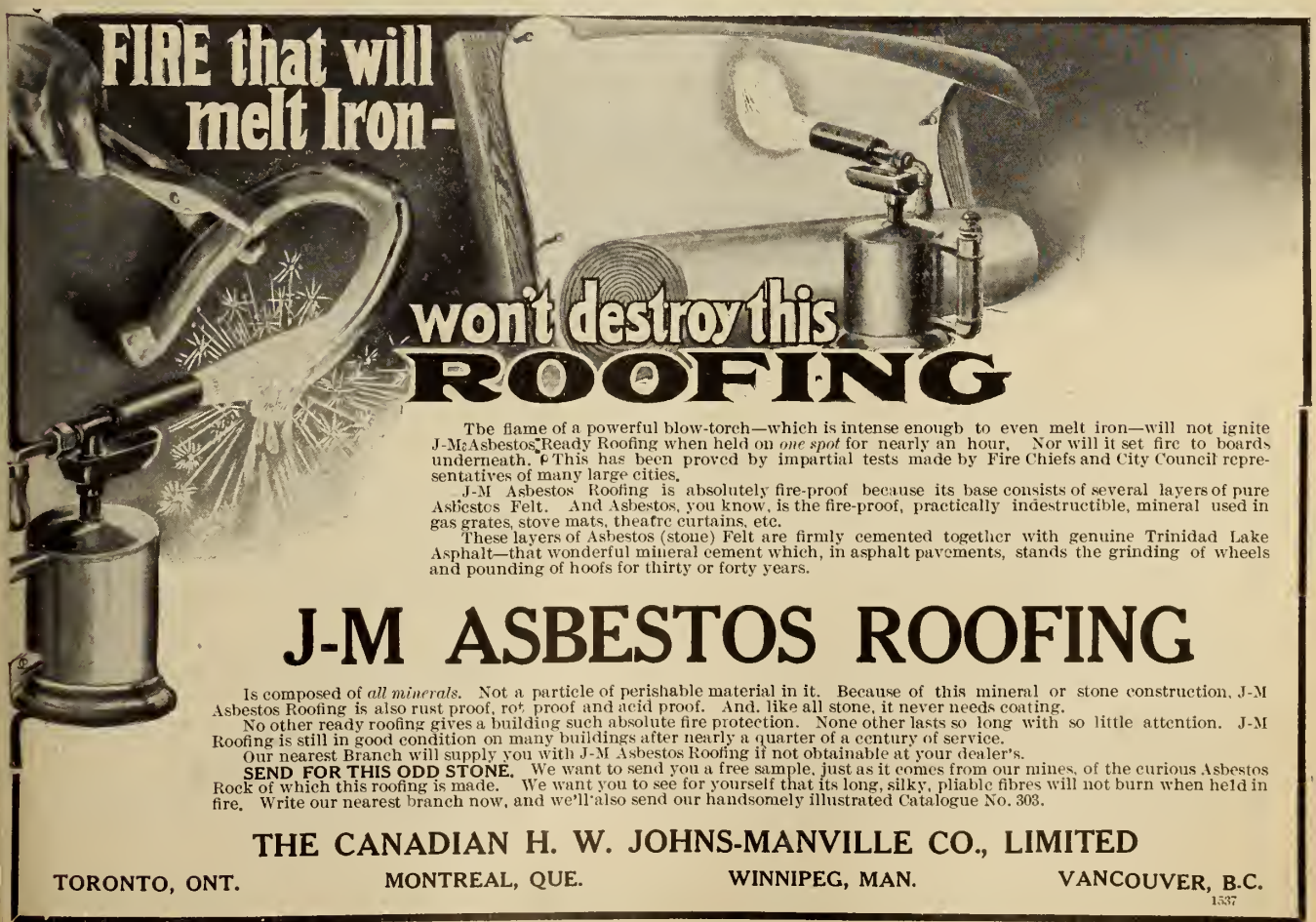

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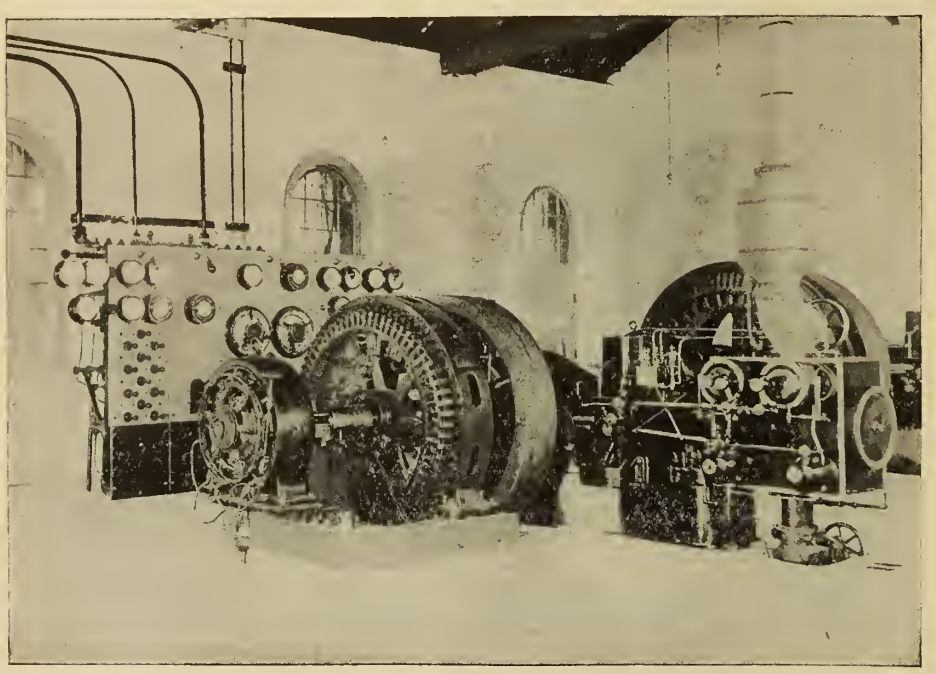

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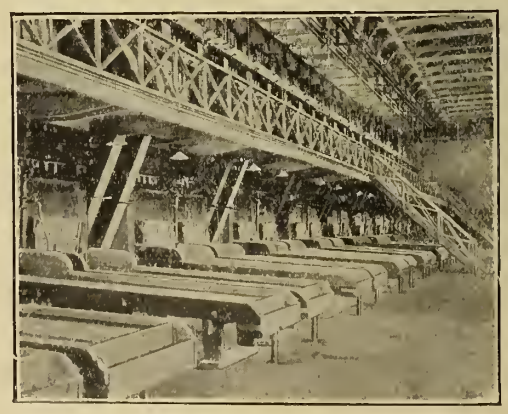

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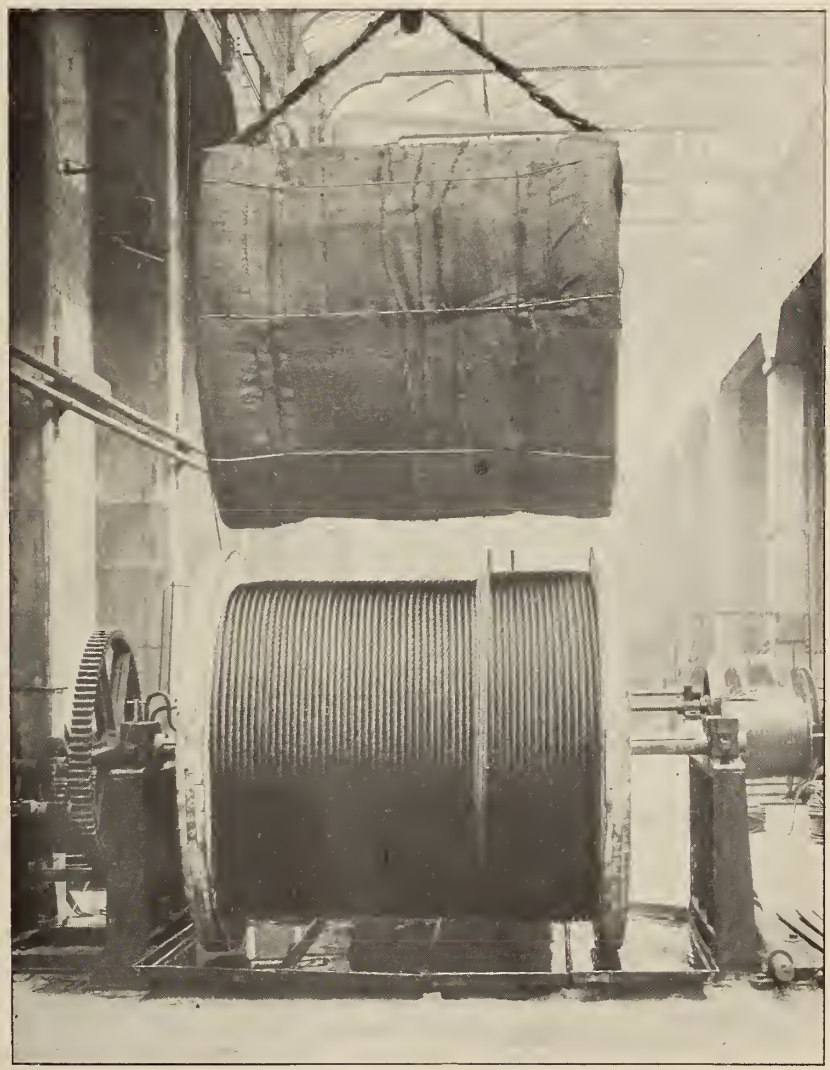

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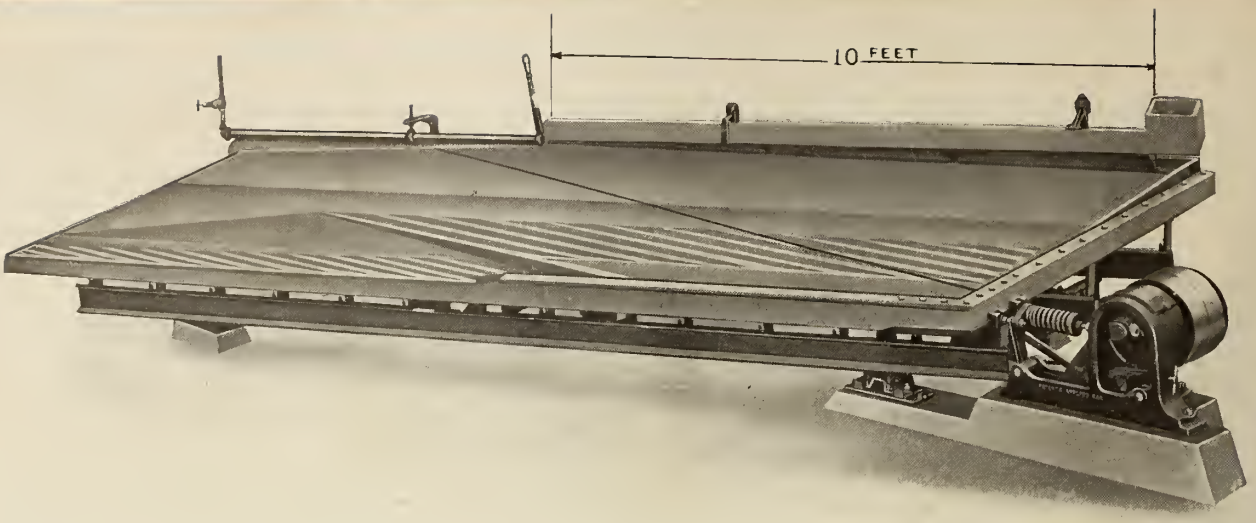

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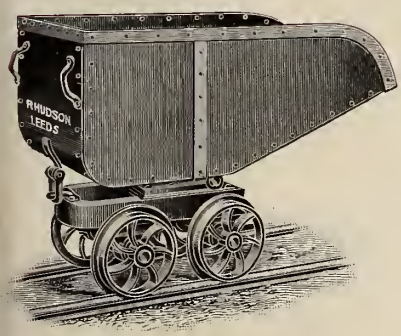

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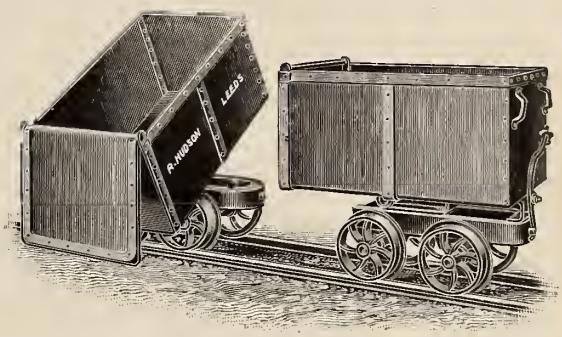

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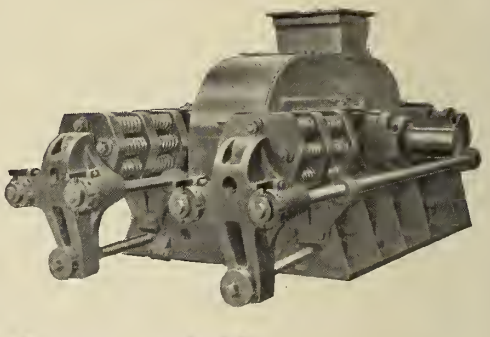

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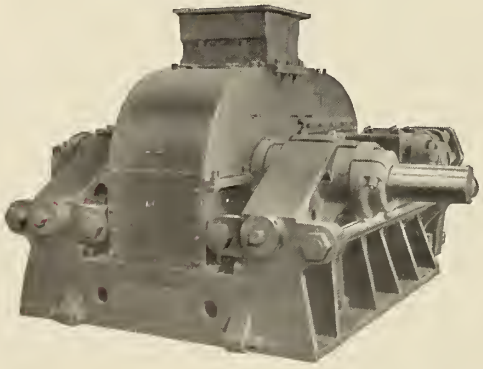

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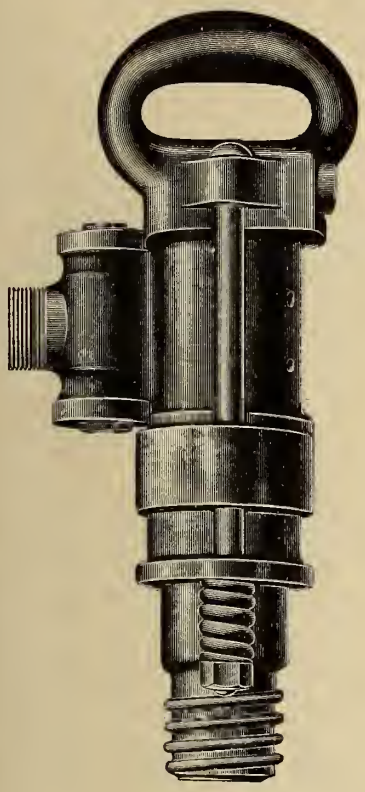

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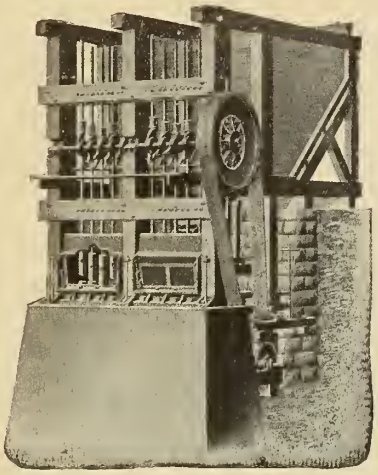

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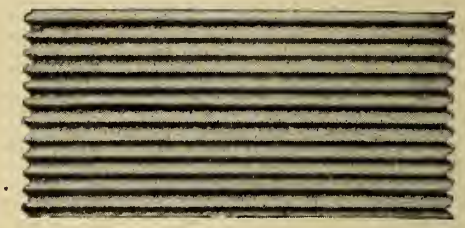

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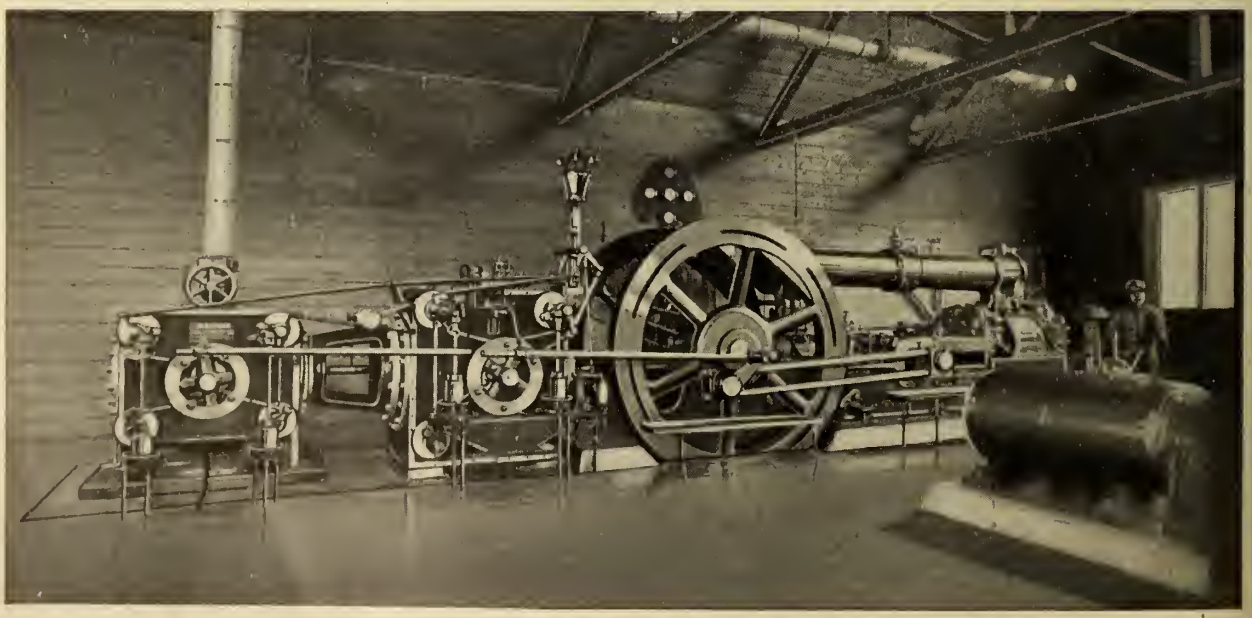

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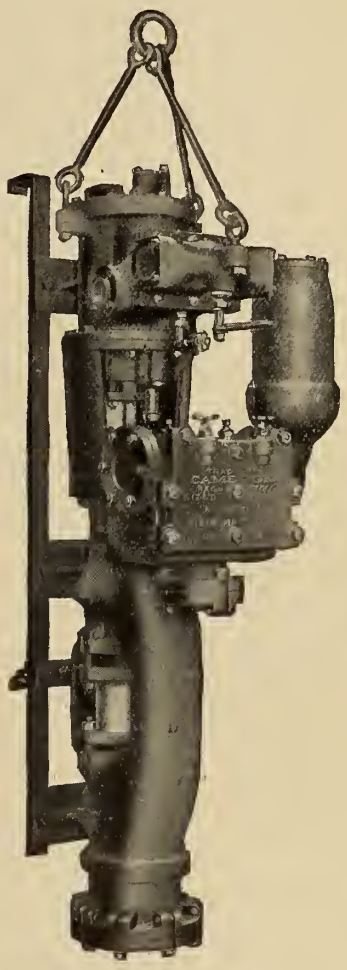

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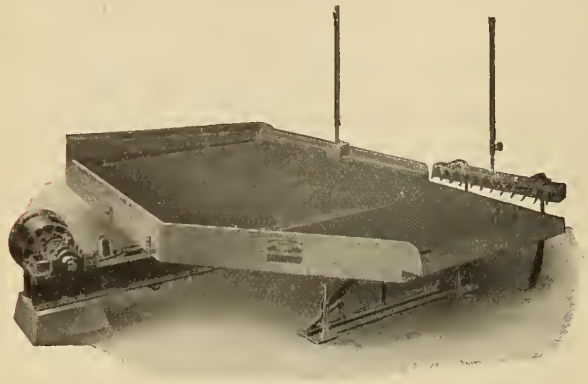

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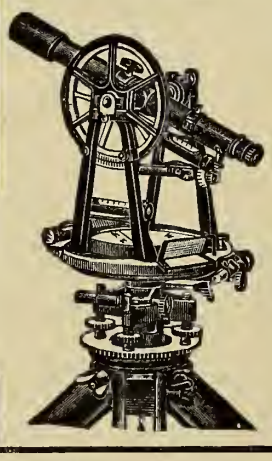

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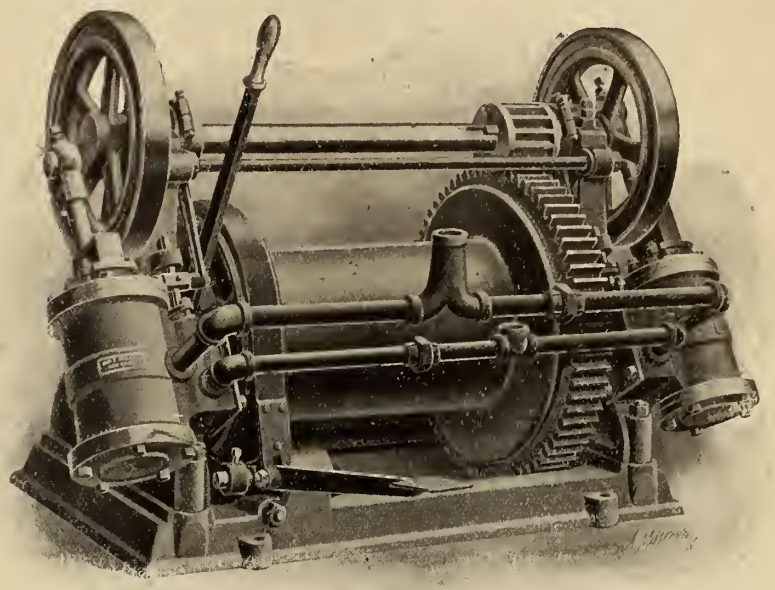

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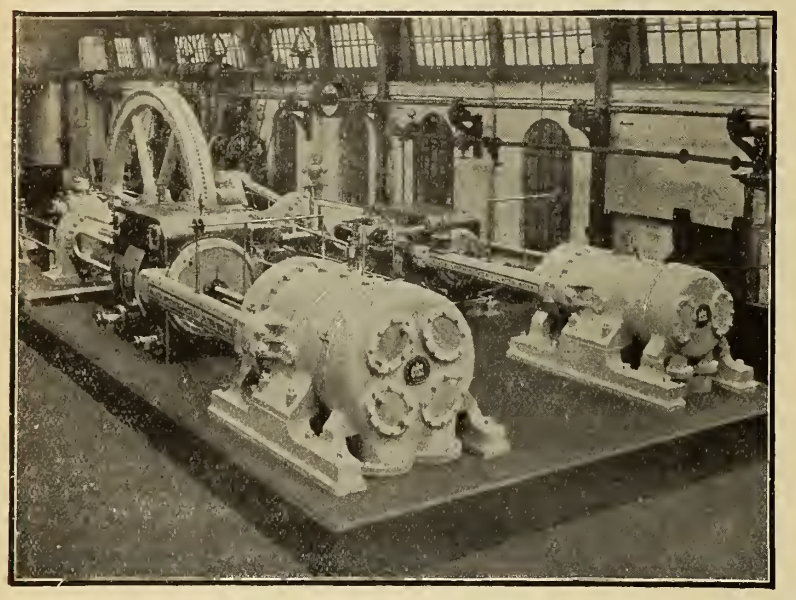

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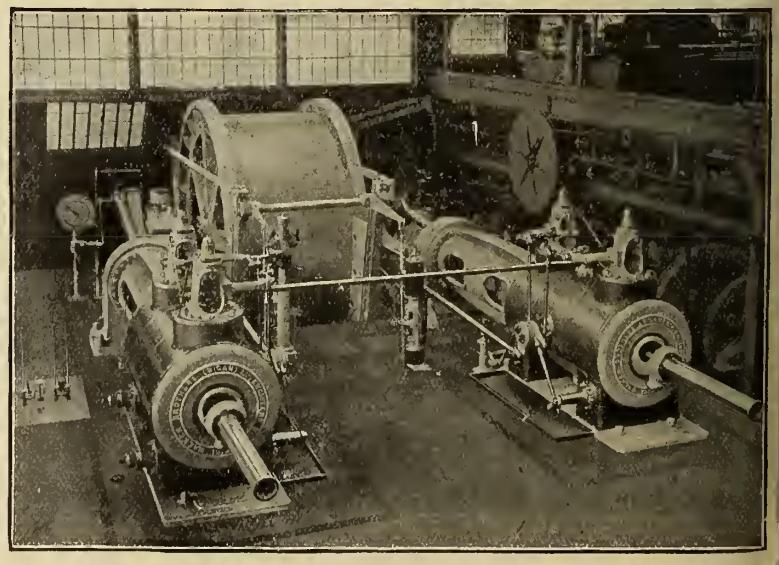

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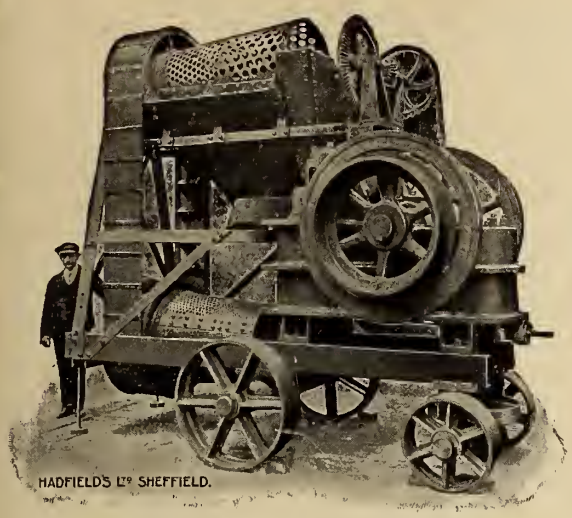

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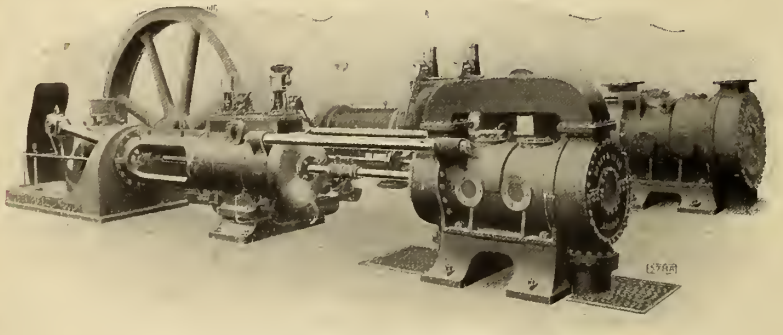

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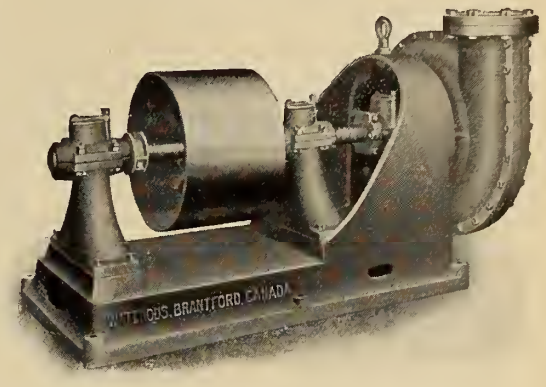

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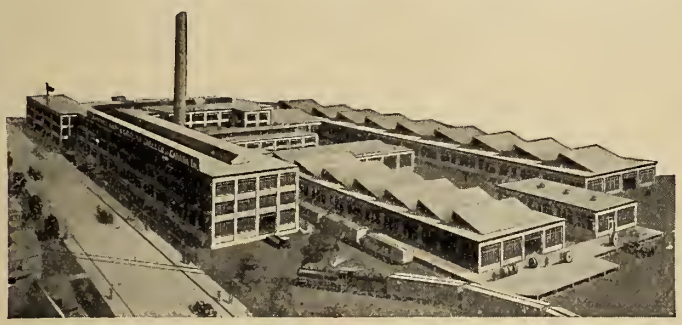

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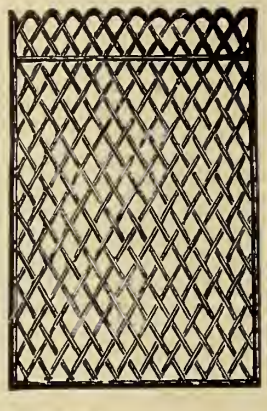

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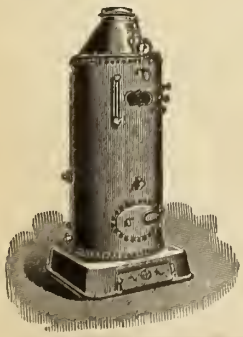

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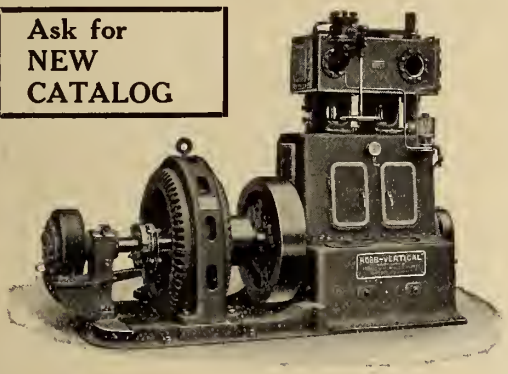

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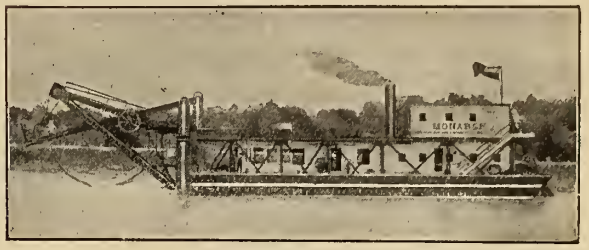

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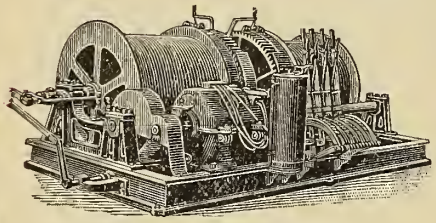

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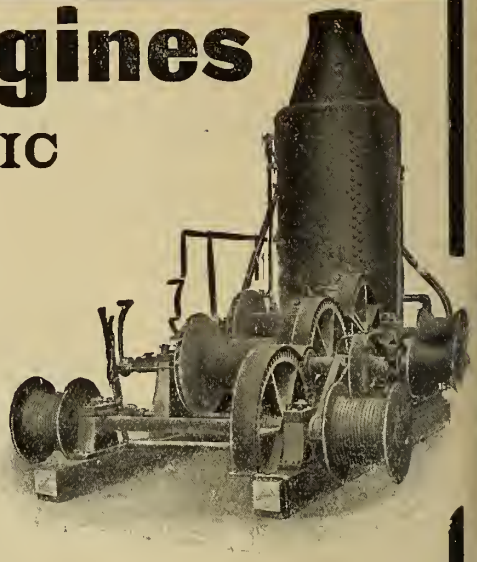

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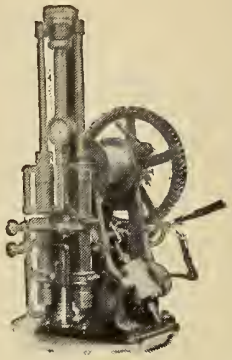

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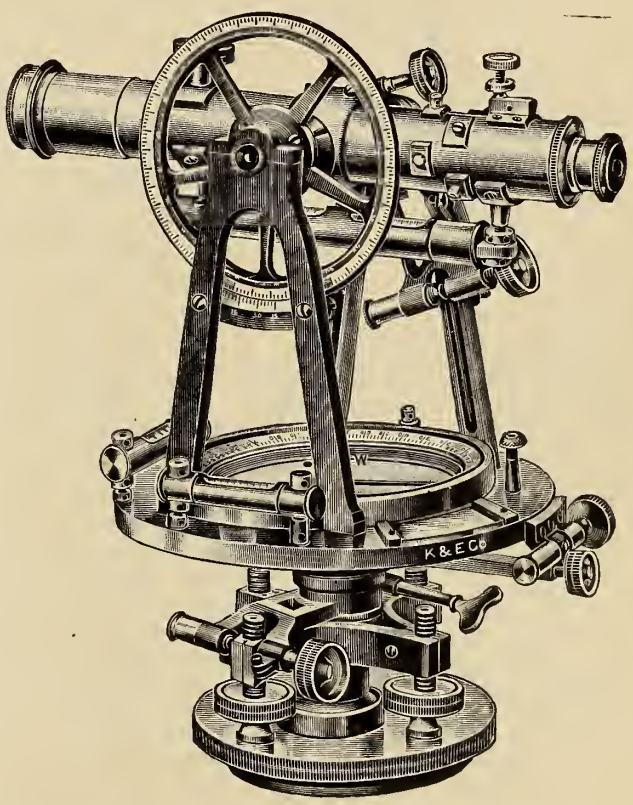

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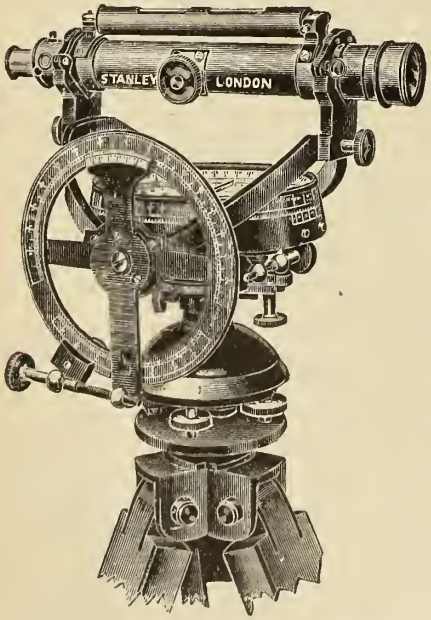

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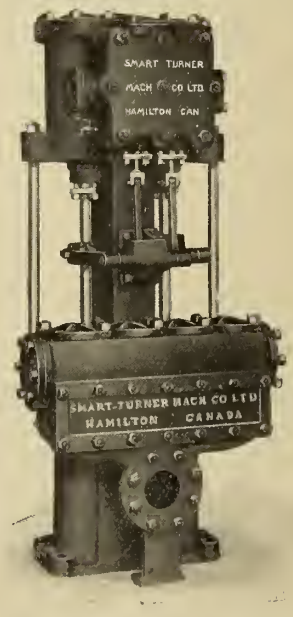

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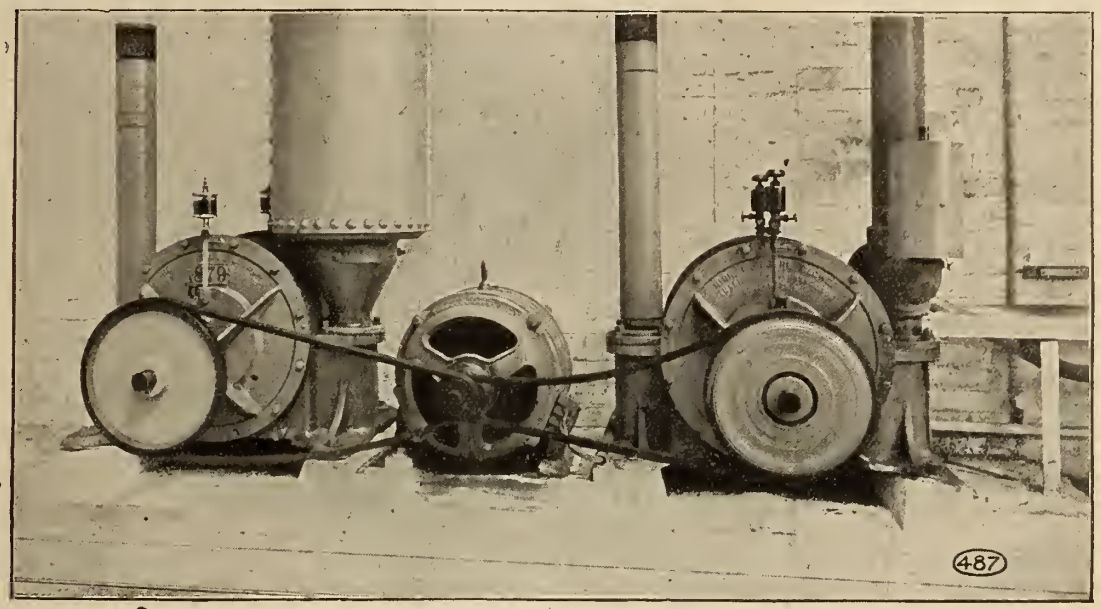

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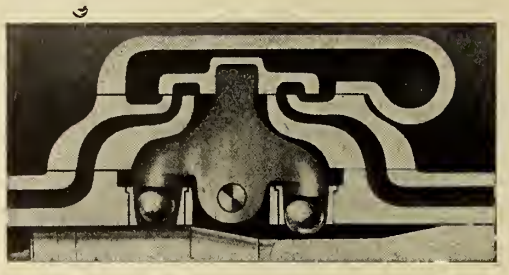

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, June 1, 1912. No. 11

The Canadian Mining Journal

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CIRCULATION.

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THE INTERNATIONAL GEOLOGICAL CONGRESS.

The first circular issued by the secretary of the International Geological Congress Committee has just been received.

As our readers know, the Congress will hold its twelfth meeting in Canada next August. Toronto will be the place of meeting. Before, during and after the meeting excursions will be organized.

Brief mention of these excursions, which will constitute the most important feature of the Congress, is not out of place.

The pre-meeting excursions are twelve in number, and are so arranged as to give the delegates the choice of examining one or more localities of geological and mining importance. For instance, although it will not be practicable for one person to join more than two or three of these excursions, yet he can readily make his plans so that he will see interesting mines or geological exposures at various places all the way from Halifax to Toronto. The geologist, the paleontologist, and the mining engineer, can pick his route to suit himself, although, of course, all three will overlap to a greater or less extent.

To the Maritime Provinces ten days are to be devoted; to the Haliburton-Bancroft area, Ontario, nine days; and to the Sudbury-Cobalt-Porcupine regions, twelve days. These longer journeyings are booked for about the same date, but there are nine shorter trips, one day to three days, from which those who participate in the former may choose.

During the period that the Congress is in session, in Toronto, a number of visits will be paid to places within easy reach of the city. As the session lasts for eight days, there will be ample time for these.

Immediately after the meeting four transcontinental excursions will leave Toronto. The details in these instances are being carefully elaborated. The delegates may travel over the C.P.R., the C.N.R., or the G.T.P. A great range of choice has been provided, and it is expected that not a few of the visitors will take advantage of the occasion to visit northern British Columbia and the Yukon, in addition to crossing the continent

It may be noted here that the railway and steamship companies have expressed their willingness to do all that lies in their power to aid the excursionists. This means much. Every effort will be made to cut down expenses and to provide for the comfort of the visitors.

The meeting of the Congress will be an event of world-wide importance. Before the last meeting in Sweden, the Executive Committee compiled a monumental series of volumes on the iron ore resources of

the world. The coal rsources of the world will be similarly dealt with for the approaching Congress. The volumes are now in course of preparation, and it is expected that they will be ready for distribution before the Congress meets.

Coal, however, will not be the only topic of discussion. Such subjects as the differentiation in igneous magmas, the influence of depth on the character of metalliferous deposits, the origin and extent of the pre-Cambrian sedimentaries, etc., will be threshed out. Thus the mining engineer will hear much that has a direct bearing upon his work, despite the fact that the Congress is primarily a gathering of geologists. In fact, every effort is to be made to make the proceedings interesting in the widest sense to both geologist and mining engineer. And, possibly, Toronto can show cause why this should be.

THE PANTOLOGIST.

Seldom have we been favoured with a gem of purer ray serene than that forwarded to us to-day simultaneously by several subscribers. It is a circular letter, typed on the paper of a well-known Toronto hotel, and written by a person with whom we unfortunately are not acquainted.

The only unremarkable parts of this efflorescent effort are the words "Dear Sir," "Respectfully submitted," and the name. After reading the letter (and it grips the imagination from start to finish), it is borne in on us that "Respectfully submitted" is quite out of place. There is neither respect nor submission in the document. But there is much else that may be touched upon.

The letter opens with a generous offer of the writer's services "in an advisory capacity." This offer, be it remembered, is being sent to consulting engineers. "If I cannot save you money, I will not charge you a cent. I have had a thorough training in *every branch* of the industry and can give you the best of references." (The italics are our own.) "Below," continues our hero, "I suggest *several avenues* of expense, which can be *materially decreased and is well worth the small price of an expert.*" (Again the italics are ours.)

Then follow such sizzling suggestions as: "One of your big items of expense in excavating is powder. If your miners make eight or nine holes to a round where five would do, if properly set, you lose the power, and time involved in making the needless holes." This scintillating discovery is equalled only by a subsequent statement that, "All ground breaks different." Do tell We feel that ourselves and all our subscribers are getting priceless pearls of practical experience for less than nothing! It's like depriving a sucking child of its nutriment! It's not fair! But it doesn't end here. Not at all. Listen again.

"Is your timbering done in the most economic manner? This is a big item of expense. If expensive sets are put in where stulls will do, you are wasting money." Canadian engineers who have acquired the habit of timbering their shafts with hand-carved mahogany, or of using lignum vitae in their stopes, or of decorating their drifts with teak and rosewood, will take notice. This loose, though pleasant, practice must be pretermitted. Even the shingling of tunnel roofs must cease.

"Are your stopes and bins properly adjusted for cheap handling of tonnage? *Every fifty cents per ton you save in handling is that much gain.*" What do you think of that! Little had we imagined that the meticulous mind of modern man could pare down expenses by imponderable and petty half-dollars. And the half-dollar saved is the half-dollar gained! Precious, pertinent fact! But let us hasten to gather more manna e'en at risk of a surfeit.

"And most important your underground work, Are you following the *proper ledge?* Are your surveys right? Can your *men* figure out faults, or ore *chutes* on the vein? Do they understand what *make* deposits of ore? Can they *make* proper assay samples of the ledge, or are they accustomed to picking out *allumining* samples from here and there." O joy! Our vocabulary is enlarged by one good word, "alluming," a hybrid, no doubt, but *what* a hybrid! Can't you see that from the illicit union of "al-lur-ring" and "il-luming" this beauteous result is obtained? And how many of us really *do* understand what "*make* deposits of ore?"

Sad to say we can spare no more space for this lesson. Nor shall we have occasion again to refer to it. So preternaturally knowing a person as our friend cannot remain long in this climate. In his own words, the last we shall quote, he has attained "*maxim* capacity." Incidentally, there would be no further need of the *Canadian Mining Journal,* if this fount of wisdom, this ineffable oracle, the Solomon of experts, were to undam the flood of his learning.

MINE REPORTS.

In our old school geographies the populations of cities, large and small, of provinces, of states, and of nations were recorded with appalling exactness—not *accuracy.* For instance, London's denizens were enumerated down to the last odd figure before the decimal point, quite regardless of the busy midwife and the energetic undertaker.

This passion for exactness is carried through into many spheres of life. It is manifestly present in the profession of mining engineering. One phase of this is dealt with by Mr. F. Percy Rolfe in a paper, "Illogical Precision in Mine Reports," read recently before the Institution of Mining and Metallurgy.

Mr. Rolfe remarks first upon the "prevalent custom of expressing large tonnages to the extreme accuracy of a single ton, and of reporting mine assays to ex-

cessive minuteness.'' He urges that these results can be expressed with equal accuracy and with greater convenience in round figures.

Development of ore bodies has but seldom checked closely with original estimates of tonnage. Ore bodies of exceptional uniformity may lend themselves to approximately exact measurement. But the ore content of irregular deposits can only be guessed at within certain limits. Broken or badly defined walls, and a score of uncontrollable factors may change the dimensions of the body at any point. In fact, the peculiarities of each vein or body are only known after the ore has been won. Thus, while it is practicable and reasonable to estimate unmined ore tonnages after preliminary facts have been determined, yet it is absurd to express estimates in finely drawn arithmetic. Small variations in width and in specific gravity introduce errors that bulk large in the final calculation. Hence round figures should invariably be used in reporting on any considerable body of ore.

Even more inept is the practice of calculating mine assays down to the ultimate cent. There is moral value, of course, in accentuating the scrupulous care that is necessary in sampling and in assaying. Hence it may be wise to insist that the assayer report the exact result obtained, not merely that result adjusted to the nearest tenth or quarter of a dollar. But over-refinement in apparatus and in method is a waste of time. Errors are inevitable in sampling and, in less degree, in assaying. When every reasonable precaution has been taken to minimize these errors, there is nothing gained by amplifying the arithmetic involved. In other words, it is foolish to carry more figures beyond the point marked by the delicacy of the methods employed. The same truth applies to the much-abused ''average assay.'' Errors in an average may be corrective or they may be cumulative. The use of the average, therefore, is excessively dangerous unless an exact knowledge of all the circumstances is pre-supposed.

To discountenance ''illogical precision'' is not to encourage sloppiness. Both are vices. Both are incompatible with commonsense.

THE JUPITER REPORT.

As an example of judicious reserve, Mr. R. W. Brigstocke's report presented at the annual meeting of Jupiter Mines, Limited, is worthy of comment.

The Jupiter in its early days was one of the much beslobbered Porcupine prospects. Extraordinarily rich surface showings threatened it with galloping consumption. However, the property was transferred to its present owners before it had been fatally affected. The Messrs. Drummond, of Montreal, and their friends are the chief owners. Mr. Brigstocke is the consulting engineer. The policy followed has been influenced only by the requirements of the mine. No attention has been paid to the stock market. The president, Mr. T. H. Hamilton, stated this fluently. ''So far as the present market value of our shares is concerned,'' he said, ''I may say that it is a matter that does not interest us in the slightest degree.''

Mr. Brigstocke's report shows that the necessary buildings have been erected and 3,000 feet of underground work accomplished for an expenditure of less than $100,000. His reference to spectacular showings of visible gold is worth repeating: ''It is a very interesting detail. . . . that phenomenally rich ore exists in the Jupiter mine. . . . While it is somewhat dangerous to lay too much stress on the results of such samples, they must, when properly taken, be reckoned with. In arriving at the average assay values, results of samples of extraordinary richness have been excluded.''

This attitude is refreshingly sane. The honest intention of sticking to essentials is apparent. Porcupine is to be felicitated upon the Jupiter report. It contains possibly too little, certainly not too much.

SILVER.

The gratifyingly high price of silver is one of the causes of the generally heightened activity in Cobalt, Gowganda, and Elk Lake district. As a matter of fact, Gowganda and Elk Lake would have come forward without the added inducement. It is recognized that they have not been fairly treated, and recent work has brought much encouragement. So also in the case of Cobalt mines, like the Nova Scotia and the Peterson Lake, the possibilities are too great to permit of their being long neglected. But the movement would have been slow had not silver reached and maintained its present high level.

India and China are, of course, the chief consumers of the world's production of silver. It seems highly probable that India, whose silver reserves are much depleted, will soon be forced to buy heavily. The successful adoption of a limited gold currency has not appreciably affected the demand for silver. India is prosperous and well able to absorb additional silver. Should this year's monsoon prove other than bad, the demand for silver will be sufficiently strong to hold, or even to raise, the price of silver.

The situation in China is uncertain. It is safe to predict, however, that if political unrest does not become too pronounced, and if the proposed Chinese loans are successfully raised, then another stimulating factor will immediately be brought to bear upon the silver market.

In brief, the whole situation at present seems favourable. This in itself affords a sense of security to those who are attempting to open new prospects or to revive abandoned mines in northern Ontario.

SIC TRANSIT.

The Royal Trust Company has issued formal notice of the forthcoming sale of the properties of the Amalgamated Asbestos Corporation. The sale is to take

place on June 10th. The only probable or expeeted bidder will be the newly-organized Asbestos Corporation of Canada. The eapital of the latter eoneern is $7,000,000, less than one-third of the Amalgamated capital.

In these columns all necessary remarks have been made about the Amalgamated. Its bequest of debt has been eleared off. The re-organization has been earried on in a manner fairly satisfactory to the majority of those most largely interested. With a strong exeeution upon whom the lessons of the past are strongly impressed, the Asbestos Corporation has every ehance to take advantage of the improving market. Impressive outputs resulting in demoralizing over-produetion will no longer be neeessary.

Failure, like war, brings its benefits.

COMPENSATION.

An important deeision has just been rendered by the Privy Counеil in the case of Kraus vs. the Crow's Nest Pass Coal Company, by which the principle is established that relatives of workmen in British Columbia residing in foreign eountries shall benefit under the provincial Workmen's Compensation Act. The Privy Counеil thus reverses the decision of the British Columbia Court of Appeals, and mining companies in British Columbia now become liable for the payment of claims, aggregating eighty thousand dollars, which have accumulated in the meanwhile. The decision is also of interest in view of the projected legislation to regulate workmen's eompensation in Ontario.

EDITORIAL NOTES.

One result of the English coal strike was that Canada placed orders for 50,000 tons of foundry pig iron in the United States.

His Royal Highness the Duke of Connaught, Governor-General of the Dominion of Canada, has consented to beeome Honorary President of the International Geologieal Congress.

The Nova Scotia Steel & Coal Company is moving from strength to strength. Late additions to the company's equipment at Wabana make it possible to mine a large proportion of ore from submarine areas.

Newspaper reports have it that Sir Sandford Fleming is behind the large new cement company. It is to be hoped that this does not imply that Sir Sandford has dropped his case against Sir Max Aitken's merger.

Of the eight fatalities reported as occurring in Ontario mines during January, February and March of this year, five were due to carelessness on the part of the victims, one to neglect on the part of the employer, and two to unaseertainable eauses.

Significant are the figures of Canada's export trade for March, 1912. The total value of the domestic exports amounted to $20,364,254. The two leading items were agrieulture and mining. The former eomes first with $9,521,258; the latter second with $5,651,990.

There is a serious strike in progress in the Waihi gold district, New Zealand. The community depends almost entirely on the mines. The loeal eouneil finds itself without funds and has been unable to eontinue the upkeep of the hospital. Order reigns, but a long struggle is expeeted.

In the mines, metallurgieal works, and quarries of Ontario there were eight fatalities during the quarter ending March, 1912. This eompares favourably with 17 during the eorresponding months of 1911. Inspector Corkill's bulletin report, issued by the Bureau of Mines, describes these aeeidents fully.

The Labour Gazette for May, which, by the way, is becoming every month a more and more indispensable publieation, reports only one strike among Canadian mine workers during April. That one strike oeeurred in Cobalt. One hundred and eighty-nine men were out for two days on aeeount of the dismissal of two men. The strikers returned to work, but the two men were not reinstated. The strike occurred at the Temiskaming mine.

A correspondent suggests that the Pari-Mutuel system eould be nieely adapted to gambling in mining shares. Like the bookmaker, the broker could be eliminated. The meehanieal equalizer would register in plain view only *bona fide* transaetions. He who ran might read. A flat commission to the Exehange would cover all the expenses of upkeep. The suggestion may be weird, but it certainly would be an improvement on that now in vogue.

Mr. Edward Hooper, recently eleeted president of the Institution of Mining and Metallurgy, in his presidential address, alluded pointedly to the ethics of professional advertising. It had been suggested that the Institution should make some pronouneement upon this question. It was thought ,however, that errors of taste or judgment will "recoil on those who overstep the boundaries of self-respeet." Henee it has been eonsidered wise to leave the matter to personal diseretion.

Ten fatal and eleven non-fatal aeeidents are reported by the Labour Gazette as oeeurring in Canadian mines during the past month of April. Only one of the fatal accidents was caused by premature explosion. During the same month agriculture is debited with five fatal and six non-fatal; lumbering with four fatal and ten non-fatal; railway eonstruction with eight fatal and seven non-fatal; building with five fatal and six non-

fatal; and steam railway service with twelve fatal and twenty-six non-fatal accidents.

Suit has been entered against the Crown Reserve Mining Company, Cobalt, for 231,143 of its treasury shares. The plaintiffs are John Black et al., of Montreal, who claim that 569,950 shares were originally set aside for development purposes in trust, that no further working capital is required and that the residue should be distributed pro rata amongst themselves, the original syndicate. The company claims that no right to the shares accrues to the syndicate, and that in any case there may be more money required for working capital.

Among the recommendations made by the Royal Commission of Mines of New Zealand are the following:—Government inspectors are to be required to pass an examination higher than that of mine managers; a coal miner must have two and one-half years' experience in hewing and timbering, and must be at least 21 years of age before having charge of a "place;" and certain extra duties of inspection shall devolve upon mine foremen. Improvement in underground sanitation, and change—and bath-houses are to be provided. To prevent miners' phthisis, the compulsory use of water sprays or their equivalent is required. A relief fund is to be provided for miners who are affected and who can prove five years' residence in New Zealand.

The behavior of nitroglycerin when heated is described in a recent bulletin of the U. S. Bureau of Mines. Nitroglycerin begins to decompose at from 50 degrees to 60 degrees C. At 70 degrees C., commercial nitroglycerin evolves sufficient nitrous fumes to permit of detection by potassium-iodide-starch paper. Even at very low temperatures it is volatile. At higher temperatures, say 135 degrees C., rapid decomposition sets in and absorbed nitrous fumes impart a reddish colour to the substance; while at 145 degrees C., strong ebullition begins. Much heat is evolved, the liquid becomes hotter, ebullition increases in violence, and at about 218 degrees C., the nitroglycerin explodes. When a temperature of between 145 degrees and 210 degrees is maintained, however, the nitro may be distilled without danger.

PERSONAL AND GENERAL

Mr. J. J. Turnbull, M.I.M.E., F.G.S.,, formerly manager of an important colliery in India and a member of Council of the Mining and Geological Institute of India, recently arrived in Canada, and hopes, by the courtesy of the managers, to be afforded the opportunity of inspecting some of the larger collieries of Alberta and British Columbia.

Mr. Victor M. Meek has resigned the superintendency of the Stobie mine at Sudbury, Ont. His present address is Port Stanley.

Mr. A. B. Coussmaker, of London, is on his way to British Columbia to investigate the platinum resources of that province.

It is understood that Mr. William Frecheville has been recommended for appointment to the professorship of mining at the Royal School of Mines, London.

Dr. J. Austen Bancroft, of McGill University, has been engaged by the Department of Mines of Quebec to make a survey and report on portions of the drainage basins of Harricanaw and Bell Rivers, in northwest Quebec. Dr. Bancroft and his assistant, Mr. A. O. Dufresne, leave Montreal for this region towards the end of May.

It is announced that Mr. C. Stanley Martin, for many years manager of works for Messrs. Camell, Laird & Co., in Cumberland, England, has been appointed superintendent of the Dominion Iron and Steel Company's works at Sydney, N.S., in the place of Mr. C. H. McMillan, who has resigned.

Mr. H. A. Lewis, formerly assistant manager of the Temiskaming mine, at Cobalt, is now engineer in charge of the Berenguela Tin Mines, Berenguela, Oruro, Bolivia.

Mr. A. B. Willmott is at Killarney, Ont.

Mr. T. H. Rea is in New York. Mr. Rea has taken an office in the Standard Bank Building, King Street, Toronto.

Mr. Frank Loring has returned from a professional visit to Gowganda and Porcupine.

Mr. H. Mortimer-Lamb, secretary of the Canadian Mining Institute, was in Toronto on May 25th.

Prof. J. C. Gwillim, of the Kingston School of Mining, passed through Toronto on his way to Vancouver on May 19th.

Mr. R. B. Lamb is making an extended professional trip to Swastika, Porcupine, and Gowganda.

Mr. O. N. Scott, mining engineer, has moved to larger offices in the Dominion Bond Building, corner King and Yonge streets, Toronto. Telephone number and cable address remain the same.

At the recent meeting at Ottawa of the Royal Society of Canada, Mr. D. B. Dowling and Mr. Wm. McInnes, of the staff of the Geological Survey, were admitted to membership. The honor is a fitting recognition of the scientific attainments of these gentlemen and of their eminent services to the country.

Mr. Fritz Cirkel, who visited his native land last winter for the first time since his arrival in Canada some twenty or more years ago, has just returned to Montreal. He was given a most enthusiastic reception in Germany by his former professional associates, who, he states, displayed a keen interest and a considerable acquaintance with the developments now taking place in the mining industries of this country.

Mr. Robert Musgrave, who now makes Victoria his headquarters, after having been for years mining in Mexico, recently returned from a trip into the Chilcoten country, B.C.

Mr. James Findlay, of Cranbrook, East Kootenay, B.C., long associated with the operation of the Sullivan Group mine and lead smeltery, is reported to be about to visit Great Britain.

Mr. Charles W. Goodale, of Butte, Montana, a well known metallurgist, has been attending a golf tournament held two or three weeks ago near Victoria, B.C.

Mr. W. R. Wilson, manager of the Crow's Nest Pass Coal Co.'s collieries in Southeast Kootenay, B.C., was called east lately owing to the illness of his wife.

Dr. J. Bonsall Porter, with the McGill Summer School of mining students, was in Alberta and British Columbia, after having visited Northern Ontario early in May.

Mr. W. H. Trewartha-James, formerly general manager of the Tyee Copper Co., Ltd., with offices in Victoria, B.C., is now practising as a mining engineer in London, England.

Mr. J. W. Bryant, after having spent the winter on the property in Southern Yukon of the British Yukon Gold Mines, Ltd., will shortly return to Victoria, B.C.

Mr. W. J. Watson, of Ladysmith, Vancouver Island, has been gazetted attorney in British Columbia of the Tyee Copper Co., Ltd., the head office of which is in London, England.

Mr. W. J. Elmendorf, general manager of the Portland Canal Mining Co., Ltd., has removed his home from Spokane, Washington, to Victoria, British Columbia.

Mr. Ernest Levy, manager of the mines of the Le Roi No. 2, Ltd., Rossland, and the Van-Roi Mining Co., Ltd., Slocan, has returned to British Columbia from a visit to England.

Mr. Arthur Lakes, Jr., manager of the Ymir-Wilcox Development Co., who had been for a time in the Kootenay Lake Hospital, Nelson, B.C., suffering with a broken leg, is about again.

Dr. D. D. Cairnes, of the Geological Survey of Canada, accompanied by three assistant geologists, left Vancouver for Dawson, Yukon, on May 2, going by steamer from Seattle to Skagway, and thence down Yukon River. It is expected that during the field work season of 1912 this party will complete the Survey's geological investigations along the 141st meridian—the Yukon-Alaska boundary—between Porcupine and Yukon rivers.

Mr. Melbourne Bailey and Mr. L. Muller, who remained in Cariboo district throughout the winter, have been busily engaged lately in making preparations for the 1912 season's gravel-washing operations on Mr. John Hopp's several placer-gold mines in the vicinity of Barkerville. Mr. Hopp, following his yearly custom, spent the winter on the coast, but will shortly proceed to Cariboo to take an active part in the hydraulicking work, which is on the largest scale of all in Cariboo mining division.

Mr. E. G. Warren, general manager of the British Columbia Copper Co., Ltd., accompanied by Mr. Frederic Keffer, geologist and mining engineer, Mr. E. Hibbert, superintendent of mines, and other local officials of the company, returned to Greenwood on May 1st after having made an automobile trip to Voigt camp, near Princeton, Similkameen, where the company is developing several of a large group of copper claims held under option of purchase, and on which the occurrence of large ore-bodies has been reported.

THE LAW OF THE PAY-STREAK IN PLACER DEPOSITS*

By J. B. Tyrrell

Twelve years ago I had the pleasure of reading a paper before this Institution** on "The Gold-bearing Alluvial Deposits of the Klondike District," in which the topographic features of the country were briefly outlined, and the general character of the gravels and the underlying rocks were indicated. At the same time it was pointed out that the two sources from which to obtain an adequate water supply for the efficient mining of Bonanza Creek were the Rocky Mountains to the north and the conservation of the water of the creek itself. It is interesting to record that both these projects, first laid before the public through this Institution, have now been completed by the building of a great ditch and flume from the Twelve Mile River, at the foot of the Rocky Mountains, and by the building of a dam across the upper part of Bonanza Creek.

This evening it is my intention to present to you, very briefly, some of the results of a study of the placer deposits of that northern country, especially with regard to any light that they may throw on the laws governing the deposition of placers and the formation of the run of coarse gold which is usually found in the bottoms of the larger valleys, and which is known as the "pay-streak" or "pay-lead." It is believed that the laws or principles here enunciated not only explain the occurrence and characteristics of "pay-streaks" in the Klondike district, but that they have general application to the concentration of heavy metals or minerals in alluvial deposits.

Placer deposits may be defined as "detrital deposits of heavy metals or minerals mechanically concentrated by natural agencies."

Prof. James Geikie defines a placer as "an alluvial deposit derived from the disintegration of metalliferous rocks and ore-bodies of various origin."

Richard Beck says.

"By detrital deposits we understand accumulations of ore formed by the destruction and re-deposition of primary deposits. These two results have been accomplished, in the main, in a mechanical, but in part, also, in a chemical way. In both cases water was the main agent used by nature for the purpose. Such a destruction and re-deposition of primary deposits may have taken place in remote geologic periods, but only in comparatively rare cases have the products of such periods been transmitted to us in a recognizable condition. On the other hand, the Tertiary and Pleistocene formations of the earth's surface contain a great number of such detrital deposits, as they are commonly called. It is customary to use the term placer gravels for the Pleistocene and Tertiary alluvial gravel deposits."

And again:

"Placer gravels are deposits of loose, more or less rolled, material derived from the destruction of older deposits, lying on the earth's surface, or at least very close to it, and containing paying amounts of ore or precious stones.

"As the material composing placer gravels has been exposed to all the influences of the atmospheric air and of the water seeping through the upper strata of the soil, placers will be found to contain, in the main, only relatively insoluble, and, in general, refractory metallic compounds, which, moreover, are protected

*Paper read before the Institution of Mining and Metallurgy. **Trans., viii, 217-229.

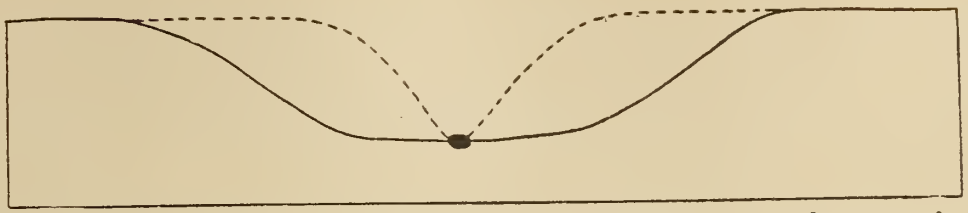


FIG. 1.—Diagrammatic representation of Pay-streak in the bottom of a simple valley.

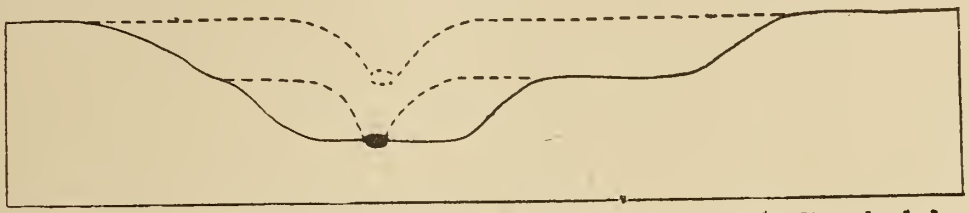


FIG. 2.—Diagrammatic representation of second Pay-streak directly below the first.

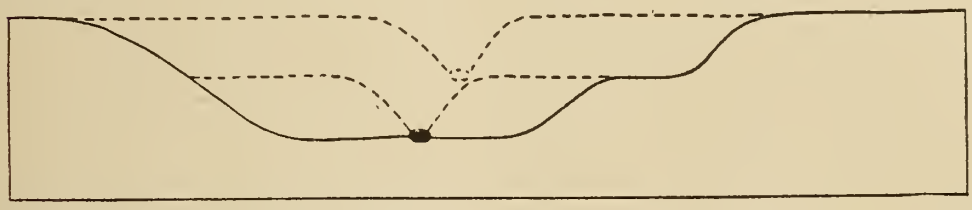


FIG. 3.—Diagrammatic representation of second Pay-streak obliquely below the first.

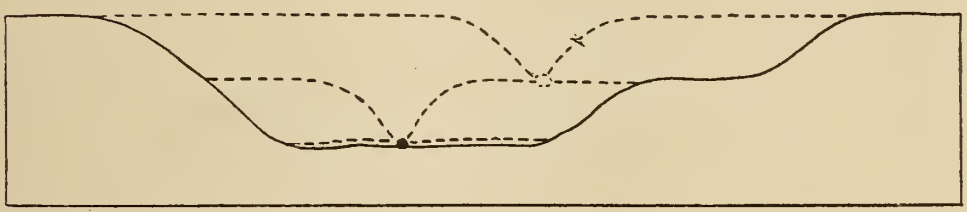


FIG. 4.—Diagram showing how first Pay-streak may be distributed in second valley.

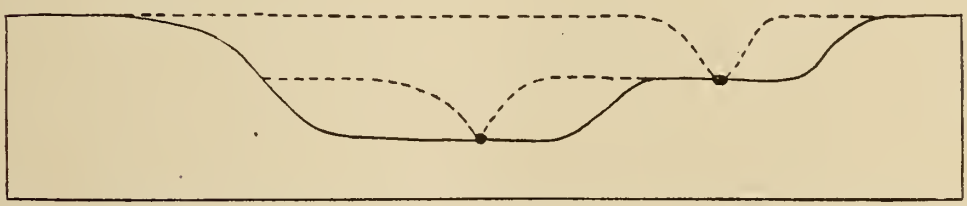


FIG. 5.—Diagram showing first Pay-streak as terrace and second lighter Pay-streak in second valley.

by their great specific gravity against easy removal by water.

"These placer gravels are usually grouped into two classes, according to their position with reference to the deposit from which they are derived, and in part, also, according to the manner of the original process in which they are derived from the primary ore deposit:

1. Residual gravels, i.e., of local origin (eluvial gravels).

2. Alluvial gravels, i.e., formed by washing. These may again be subdivided, according to age, into recent, Pleistocene and Tertiary gravels.

"Residual gravels, the rarer of the two groups and certainly the less extensive, are found in the immediate vicinity of the original ore deposits, and quite independent of water-courses, viz., on mountain slopes, plateaus, and sometimes even on mountain summits.

"On the contrary, the gravels formed by the transporting and washing action of water are found only in the channels of brooks and rivers, in fresh-water lakes or along the sea-coast. They lie for the most part within the present valleys or along the present shore, but are also often found in stretches of fluviatile sediments, sometimes intersecting the present direction of the valley on old river terraces, or in sheets covering plateaus (California, Ohlapian in Transylvania), and, finally, in old shore terraces above the present level of the sea. Their material is always much rolled, and for the most part is assorted, according to the size of the ingredients, into shingle, gravel, sand, clay, mud, etc."

Residual gravels occur on many of the higher slopes in the Klondike, but only in few cases do they form workable placers. The best illustration of such placers which came to my notice was on the upper portion of Victoria Gulch, one of the tributaries of Bonanza Creek, where some beautiful sharp "spinel twins" of gold were found, just in the condition in which they had been washed out of a vein that outcropped higher up towards the summit of the ridge.

Most of the placers in the country are such as are designated above "alluvial gravels" and belong to the class of alluvial gravels found "in the channels of brooks and rivers."

In many of these alluvial gravels that occur throughout the Klondike some gold can be found, but in the gravel deposits in the bottoms of most of the wider valleys, whenever gold is present, it is not evenly distributed, for most of the coarser particles are found in a band of restricted width which lies on or close to bedrock, and wherever the bedrock is fissured these particles descend into it for varying distances. This band or run of coarse gold is known as the "pay-streak," and the discovery of it beneath the gravel of the alluvial plain is the constant desire of the prospector.

The existence of this pay-streak has been recognized by placer miners from time immemorial.

A. G. Lock refers to it as the "gutter," which he defines as the lowest portion of a lead, which contains the most highly auriferous dirt."

Posepny states: "The gold occnrs concentrated in the deepest portion of the weather-detritus, that is to say, on the contact with bedrock, and has penerated all the open, loosely-filled fissures in the latter."

Beck states: "It would, however, be an error to assume that in a cross-section of a river valley the lowest layers of shingle, gravel or sand are throughout the richest. On the contrary, the values in this horizon are variable and pay gravel is ordinarily limited to streaks of greater or less width, which are found in one place in the centre of the valley, in another along one side, now nearer, now further away, from the present water-course."

W. Lindgren writes of the pay-streak as follows: "It is well known to all drift miners, however, that the gold is not equally distributed on the bedrock in the channels. The richest part forms a streak of irregular width referred to in the English colonies as the 'run of gold' and in the United States as the 'pay-streak' or 'pay-lead.' This does not always occupy the deepest depression in the channel and sometimes winds irregularly from one side to the other. It often happens that the values rapidly diminish at the outside of the pay-lead, but again the transition to poorer gravel may be very gradual. An exact explanation of the eccentricities of the pay-lead may be very difficult to furnish."

It is true that the pay-streak very often seems to be one of the most elusive of phenomena, and time and again the prospector is inclined to say that there has been no advance in the knowledge of the laws which govern the deposition of placer gold since the days of Job, 35 centuries ago, and that all that can be said now, as then, is that "There is a vein for silver and a place for gold."

But the pay-streak is a feature in the structure and growth of the valley in which it occurs, its formation is governed by certain geological laws, and those laws should be recognizable without great difficulty if the growth of the valley can be traced with reasonable accuracy.

In what we now know as the Klondike district, marine sediments were laid down at various periods up to the beginning of Tertiary times, and after their deposition they were raised, crushed and bent into their present form and position.

The country was then worn down to base level, and a peneplain, the remains of which can now be seen at an elevation of about 3,300 feet above the sea, was formed. This peneplain may be called the "dome peneplain," as portions of it are distinctly recognizable in the vicinity of the mountain known as "The Dome." For our purpose the period of its formation may be designated as the "first cycle of erosion," since the history of the gold-bearing gravels would appear to begin with it and no gravel deposits have yet been recognized on it.

After the dome peneplain was formed the "first period of elevation" began, and the country was raised to a considerable height above the sea. The Yukon River, which had probably been outlined at an earlier period, immediately began to erode its channel, while the water, which fell as rain on the elevated Klondike land, carved out smaller valleys to carry the drainage from it to the larger river. As the Yukon River was a powerful eroding agent it deepened its valley rapidly, and at the same time the smaller streams radiating from The Dome, such as Bonanza, Hunker, Dominion, Sulphur Creeks, etc., kept excavating their channels to keep pace with the lowering of the bottom of the valley of the Yukon River, which was the master-stream into which they flowed.

During all this time the valleys of these smaller streams maintained the general character of gulches or young valleys, with V-shaped cross-sections. But little gravel or loose material remained on the rock which formed the bottoms of their channels, for it was being constantly moved downward by the current towards the Yukon River, and, on the way, was helping to cut deeper and deeper into the rock over which it travelled.

While this process of deepening the valleys was in progress, detrital material was being constantly brought into them by wash from their sides and by smaller streams from the ridges between them, and, as the rocks from which this material was derived were gold-bearing, the detritus contained a small quan-

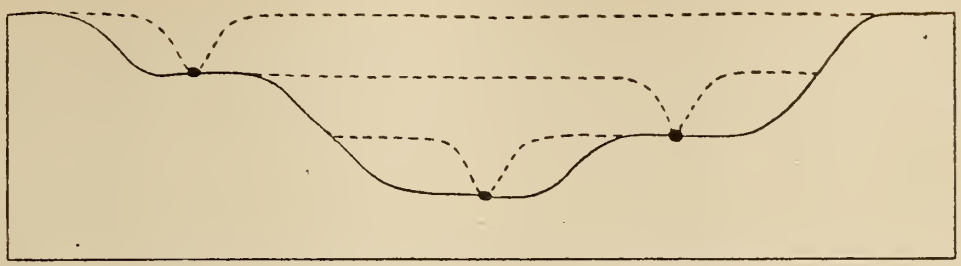


FIG. 6.—Diagram showing three Pay-streaks at different elevations.

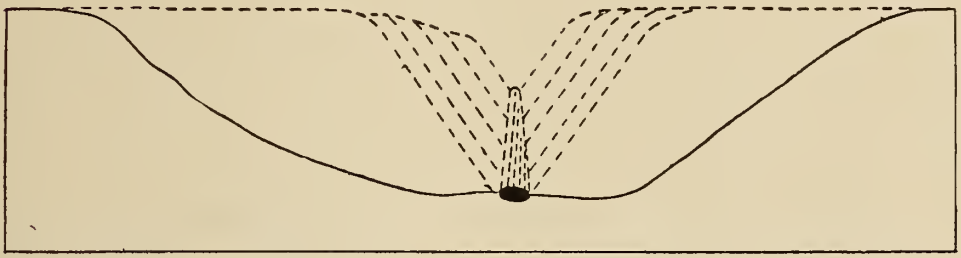


FIG. 7.—Diagram showing formation and downward growth of a Pay-streak in a wide valley.

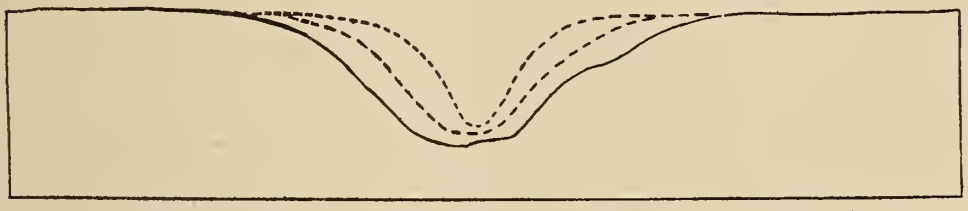


FIG. 8.—Diagram illustrating the transformation of a V-shaped valley into a U-shaped valley. (After Chamberlin and Salisbury.)

FIG. 9.—Diagram to illustrate the widening of a valley flat by erosion. (After Chamberlin and Salisbury.)

tity of gold. Thus gold and particles or masses of rock were fed gently into the main streams.

Now, a stream with a certain velocity is able to carry pebbles of a certain size and specific gravity. If the specific gravity is constant the diameter of the pebbles which it can carry will vary according to the square of the velocity, and if the velocity remains constant, the size of the pebbles will vary according to the specific weight of the substance composing them weighed in water. For instance, if the velocity of a stream is doubled it is able to carry pebbles of quartz four times the diameter, or 64 times the weight, of those which it could carry before. If, on the other hand, one pebble is of quartz and the other is of gold, which is 11 times as heavy as quartz weighed in water, the volume of a pebble of quartz which can be carried by the current will be 121 times (11.2) as great as that of a pebble of gold, or, in other words, the dia-

meter of the pebble of quartz will be about five times the diameter of the pebble of gold.

Again, if particles of quartz and gold of equal size are dropped into water the gold will sink to the bottom with more than three times the velocity of the quartz.

Where the fragments of rock, consisting of quartz, schist, granite, etc., and gold, are fed into the stream, they are caught by it and carried along the bottom until they lodge in some crevice or opening, from which they cannot be dislodged except by upward currents, and these upward currents will lift any pebbles of quartz or similar rock which are less than five times the diameter of nuggets, or grains of gold occurring with them, before they will lift the gold, even if the quartz and gold are equally accessible. This makes the removal of the gold exceedingly difficult as long as the crevice remains, for the upward currents will constantly carry away the finer and lighter rock, and undermine the grains of gold and allow them to sink. When the finer and lighter material is carried away, the coarser and lighter pebbles are exposed to the force of the current, and the smaller and heavier grains of gold are able to obtain lodgment beneath and between them so as to be almost inaccessible. In fact, under normal conditions, the spaces between the lighter pebbles are large enough to hold any grains of gold which could be carried by the current flowing over them.

It is thus shown that gold will remain permanently in a fissure of the rock in the bottom of a stream as long as that fissure remains in existence, and also that it will remain between or beneath larger pebbles and boulders as long as these remain unmoved.

Now, the small streams of the first period of elevation, which developed into, or was succeeded by, the second cycle of erosion, continued to cut down their channels as long as the Yukon River continued to deepen its valley. During all this the bottoms of their valleys continued to act as sluices, which were more or less efficient agents in collecting and retaining gold according to the character of rock of which they were formed. If the rock where the gold was discharged into the stream was a fissile schist standing on edge the gold would be caught at once, while, if it was a massive granite or other similar rock, without joints or fissures, or a smooth horizontal schist, the gold would be carried down-stream over it until it would be caught by some more favourable rock. In this way there would be rich places, poor places, and blanks in the streak of gold deposited in the bottom of the valley.

As the stream would continue to deepen its valley very gradually, almost imperceptibly, by downward erosion, those places which were underlain by schists standing in a vertical or highly inclined attitude would continue to hold the gold which they had already caught, and to accumulate more, for fissures would open as fast as the surface was worn away, and the gold would sink into them as they opened. On the other hand, those places which were underlain by a harder bedrock, and which had probably also a steeper grade, would remain barren. If, again, the character of the bedrock should change from "open" to "tight," the gold which it had held might be undermined by the continual downward erosion, and so be brought again within the influence of the transporting power of the running water, by which it would be carried along to find some new resting place farther down the stream.

When the Yukon River had eroded its valley down to base-level, the smaller inflowing streams were no longer obliged to continue to deepen their respective valleys to keep pace with it, but were able to cut them down to grade, and then to widen and form flood plains in them, thus changing the V-shaped valleys into U-shaped ones, floored by alluvial plains through which the rivers and brooks meandered from side to side.

A normal stream decreases in velocity and gradient as it descends its valley and reaches grade near its mouth before it has cut down the rest of its valley to grade. So, when each of these streams had cut down the lower portion of its valley to correspond with the base-level established by the Yukon River, it would begin to meander and extend the width of its floor. At the same time, with the decrease in gradient the velocity of the current would decrease, and its transporting power would be diminished. Consequently, part of the detrital material which would be brought down by the upper and swifter portion of the stream would be dropped where the current was retarded by the decreased gradient, and would lodge in the bottom of the valley and form a "flood plain" or "alluvial plain." This alluvial plain would be first formed where the V-shaped valley changed into a U-shaped one.

Most of the gold which had previously been discharged into the stream with the detritus from the adjoining hills and ridges would have already lodged in the bottom of the V-shaped valley, and would have settled down almost vertically as the bottom was lowered by the downward erosion of the stream. If any gold was carried down to the mouth of the V it would have a very strong tendency to settle just where the velocity of the current was diminished, or at the head of the flood plain, and the weaker current would have no power to pick it up again, or to release that gold which was already present beneath it on account of having been previously caught in the bottom of the V-shaped valley. Thus the pay-streak would be formed. Afterwards the gravel, sand, and alluvium of the flood plain would be deposited over and beyond it, but it would continue to mark the position of the bottom of the old V-shaped valley, no matter how wide the bottom of the mature valley might afterwards be extended.

After a flood plain had been formed at the mouth of a valley the river farther up stream would still continue the downward erosion of its channel until it reached the grade of that below it, when lateral plantation and the formation of the flood plain would begin. Thus the flood plain was formed gradually up the valley from its mouth, and always, where the old V-shaped valley changed into a U-shaped valley, there was left a trail of gold beneath it.

The gold which was collected and stored in the bottom of the V-shaped valley had been derived from the rocks of the adjoining country. At the same time the lighter material derived from the disintegration of these rocks had been carried through the valley and out beyond its limits, for the stream was then cutting down and enlarging it, and not filling it up, and there was very little room beside the stream for the accommodation of loose rock material. At the head of the flood plain this gold, which had been concentrated from the rocks of the surrounding country through

previous ages, was gradually covered, and hemmed in on both sides, by gravel and alluvial material brought down by the stream at a later date. Therefore the gold in the pay-streak was derived from its home in rocks at a date which preceded that of the formation and deposition of the gravel which overlies and surrounds it.

The gravel of the flood plain may itself contain some gold which had been washed down the stream with it, or which had been washed into the valley from the sides, but this gold is usually very fine, such as might be carried readily by the stream for long distances.

If, after the flood plain was once formed, the stream should continue to deposit gravel to considerable thickness in the bottom of the valley through which it meanders, the source of supply for the gold would, on account of the general wearing down of the country, become more and more remote, and the average gold contents of the gravel would gradually decrease from below upwards.

The laws governing the formation and position of the pay-streak in an alluvial plain in the bottom of a valley may therefore be stated as follows:—

1. It was formed in the bottom and at the mouth of the V-shaped valley, which was the young representative of the present valley.
2. It marks the position formerly occupied by the bottom of that V-shaped valley.
3. The gold contained in it was washed out of the surrounding country and collected into approximately its present position before the gravel of the flood plain (or terrace) was deposited over and around it.

It has been assumed, for purposes of illustration, that the growth of the valleys in the Klondike district, which empty into the Yukon River, was continuous and regular throughout the second cycle of erosion, and in view of their symmetrical character, and the regularity of the pay-streak, which has been shown to have existed in them, it is probable that this assumption is not very far from correct; but nevertheless there were doubtless interruptions and cessations, both in the regular course of erosion and sedimentation.

After the Yukon River had cut its valley down to base level in this White Channel period, or second cycle of erosion, the tributary streams flowing from the Klondike district also widened their valleys and formed flood plains, as has just been described.

Then there was a long period of quiescence, during which the base-level of the country was raised, permitting heavy accumulation of gravel in the valleys, while at the same time the hills and ridges were worn down to mature forms. At the mouth of the valley of Bonanza Creek the local gravels, derived from the watershed of the creek itself, accumulated to a thickness of more than 200 feet. These gravels can still be recognized forming terraces at many places on the hills several hundred feet above the bottom of the valley, and Mr. McConnell, who has carefully measured them, has shown on a map accompanying his report a pay-streak running in a very straight line through and beneath them. According to the laws here formulated, this pay-streak was formed in the bottom of the old V-shaped valley, which represented the valley of Bonanza Creek at the White Channel period in its youthful stages, and it now tells us the original position of the bottom of that V-shaped valley.

Just before, or at the termination of, the second cycle of erosion, the Klondike River brought a heavy load of sediment down from the mountains to the east, and covered the bottom of its own valley, and the mouths of its tributary valleys, with a bed of gravel, which, opposite the mouth of Bonanza Creek, has a thickness of 150 feet. The influx of this gravel caused the lower portion of the latter stream to move westward, almost to the limit of its own flood plain, as to be ready to begin a new rock valley with the advent of the next erosion cycle.

After the deposition of this upper gravel in the valley of the Klondike River a period of elevation set in and the third cycle of erosion was inaugurated, which has continued down to the present time.

With the advent of this cycle of erosion the Yukon River was rejuvenated and again began to actively deepen its channel, and at the same time the tributary streams also began to deepen their old channels, or to cut out new ones, in order to keep pace with the master-stream. The Klondike River, the largest affluent of the Yukon in this district, probably did not lag very far behind it in the work of downward erosion, but its tributaries, such as Bonanza and Hunker Creeks, undoubtedly continued to flow in narrow, V-shaped valleys as long as the main stream was actively engaged in deepening its channel.

Opposite the mouth of Indian River the Yukon River has not deepened its channel as far below the level of the channel of the second cycle of erosion as it has at the mouth of the Klondike River, and the Indian River itself, being a smaller stream, has not cut back its valley as fast as the Klondike River, so that Dominion, Gold Run, Sulphur, and the other tributaries of Indian River, have not had the same opportunity to deepen their channels as the tributaries of the Klondike River.

During the third cycle of erosion the smaller streams, and especially those flowing into the Klondike River, have cut down their channels to grade in narrow valleys, and have widened the bottom of those valleys by lateral planation and the formation of flood plains, giving them a U-shaped profile. Terraces have been formed on the sides of the valleys, indicating halts in the progress of downward erosion, and narrow V-shaped gulches still carry small, or intermittent, streams into the sides of the main valleys.

Pay-streaks, which have now been almost entirely mined out, ran beneath the flood plains down the bottoms of these valleys, or crossed the terraces on their sides, and other pay-streaks were in process of formation in the gulches until that process was arrested by the work of the miner.

It is not necessary for our present purpose to follow the growth of these younger valleys in detail, or to trace the formation of the pay-streak in them, for that was clearly governed by the laws which we have already enunciated, but it will be interesting to indicate a few of the eccentricities which may have been introduced in the pay-streak by irregularities in the growth of the valleys in which they were formed.

We have already seen that difference in the character of the bed-rock will produce a marked difference in the quantity of the gold in the pay-streak.

A variation in the supply will also influence the richness of the deposit, as may be clearly seen in many of the small lateral streams which flow into the main creeks. Some of these cut across the old pay-streak of the second cycle erosion, and where this occurs the

gravels in the bottoms of these streams is enormously enriched.

Temporary cessation of downward erosion, with the corresponding formation of flood plains at successive levels, would appear, however, to exert the most powerful influence in affecting the nature of the pay-streak and introducing irregularities into it.

Let us suppose that a valley has been eroded down to the first level, and that a flood plain has been formed at that level. The pay-streak will occupy its normal position in this flood plain on the line of the bottom of the old V-shaped valley, as shown in Fig. 1.

If the stream is rejuvenated and again begins to deepen its valley a number of other conditions may occur.

1st. It may cut down its channel directly beneath Pay-streak No. 1, in which case the pay-streak will simply be lowered, and will contain practically all the gold from the older pay-streak, as well as any gold that may have been collected into the channel since the time of its formation, as shown on Fig. 2.

2nd. It may cut down its channel to one side of Pay-streak No. 1, and while still actively engaged in downward erosion may undercut the pay-streak, and allow the gold to slide down the side of the valley into the stream, where it will be carried downwards until it finds a new resting-place. In this case, too, the second pay-streak will contain most of the gold that was in the first, but it will have undergone a decided movement down the stream. See Fig. 3.

3rd. The stream may cut out its second V-shaped valley entirely to one side of the first pay-streak, but when it again begins the process of lateral planation, and forms its second flood plain, it may undercut the pay-streak and allow it to fall into the meandering stream, where part of it may quickly sink and form a pocket off the line of the true second pay-streak altogether (though it will give an indication of the former position of the first pay-streak) while part of it may be carried down by the stream and distributed in its winding channel. The true second pay-streak itself will, in this case, probably be very weak. See Fig. 4.

4th. The second channel may be formed altogether to one side of the first pay-streak, in which case the first pay-streak will be on a terrace and the second pay-streak will probably be weak. See Fig. 5.

Any of these conditions may occur in different parts of the same valley, and their relative intensity, or rapid changes from one to another, may cause great variations in the character of the pay-streak.

A greater number of stages in the deepening of a valley would allow for a still greater complexity in the character of the one or more pay-streaks which might be found in it, and these might be still further added to by a filling of the valley with detritus and partial re-excavation at one or more different times. But, for the period in which it was formed, the pay-streak represents the bottom of the young V-shaped valley, which formerly occupied part of the present valley.

PERSONAL AND GENERAL

Mr. T. Gibson, general counsel to the Lake Superior Corporation, and Mr. R. W. Brigstocke have succeeded Messrs. Masten and Wood as directors of the Jupiter Mines, Limited.

Mr. J. B. Tyrrell has arranged with Mr. S. N. Graham to attend to his professional business during the former's absence this summer.

Mr. Jas. G. Ross, consulting mining engineer of the Milton Hersey Co., Limited, Montreal, has returned from a professional trip to the Porcupine country.

Mr. J. H. Plummer, president of the Dominion Steel Corporation, has returned from Europe.

Dr. Frank D. Adams, president of the International Geological Congress, is visiting Halifax on business for the Congress. While there he will also attend the ceremonies in connection with the opening of the new wing of the Technical College.

Mr. Norman Fisher, manager of the Temiskaming Mine, Cobalt, and Mr. G. R. Mickle, Provincial Mine Assessor of Ontario, were in Montreal last week as witnesses in the case of Black et al. vs. the Crown Reserve Mining Company.

BEAR RIVER COAL FIELD, B.C.

By C. F. J. Galloway, B.Sc.*

Concluded from May 15th issue

The Grand Trunk Pacific is building a length of 150 miles in each direction from Fort George this season, and will have steamers running down the Fraser from railhead to Tete Jaune Cache to Fort George as soon as navigation opens, so that it will be a very short time before this coalfield will be put in communication with the outside.

The market for the Bear River coal will be entirely in the central portion of the Province, a vast area in which it is the only workable coal (except lignite) yet known.

Within the next three or four years this country will be traversed by a number of railways, which will open up an enormous amount of fine agricultural land, and what is now practically an uninhabited country will support a large population, for which Fort George will be the natural metropolis.

The main line of the Grand Trunk Pacific Railway, now under construction, will probably be completed next year, running from Prince Rupert to Hazelton, and thence through the fertile Bulkley and Nechaco valleys to Fort George, and from these up the Upper Fraser valley to Tete Jaune Cache, and through the Yellowhead Pass into Alberta.

The Pacific and Great Eastern Railway, from Vancouver, up Howe Sound, across to Lillooet, and thence up the Fraser valley to Fort George, is to be completed by July, 1915, according to the announcement recently made by Premier McBride. This will open up a great stretch of fertile country, and put the central interior in direct communication with Vancouver.

The main line of the Canadian Northern Pacific passes to the south of the central portion of the Province, but that company has recently acquired a charter

*Written for the Canadian Mining Journal.

Workable Seams have been found in these banks

Steamer "B X" in Fraser River

Part of Bear River Coalfields

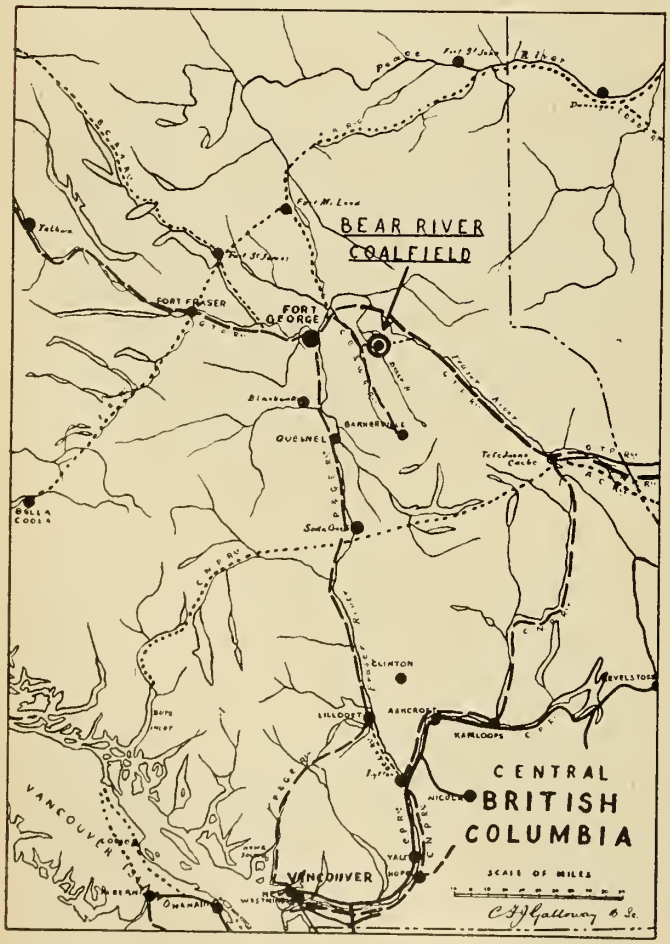
Bear River—Willow Creek Pass in distance

South Fort George from across Fraser River

to build a line to the coast at Bute Inlet. This line may pass straight across from Tete Jaune Cache to the coast, as indicated on the accompanying map, or else parallel the Grand Trunk Pacific to Fort George, and thence to the head of Bute Inlet. This latter alternative would seem probable from the fact that it is announced that this railway has applied for yardage space in Fort George.

The Alberta Central Railway, a line identified with the Canadian Pacific, coming from the main line of the latter, via Red Deer, Alta., to the Yellowhead Pass, is expected to make for Fort George, having also applied for yardage space there, as has likewise the Edmonton, Dunvegan and British Columbia Railway. This line, said to be a Grand Trunk undertaking, is already built for some distance north from Edmonton. It will pass through the Peace River country of Alberta and British Columbia, thence coming south to Fort George.

A charter has been granted for a line from Fort George to Fort Macleod and thence to the Peace River country, with a branch from Fort Macleod via Fort Fraser to Bella Coola. Engineers are now in the field, and work is expected to begin very shortly. This line



will serve to give an outlet to the grain from the Peace River, and also to put it in direct communication with Vancouver.

The British Columbia and Alaska Railway has a charter for a line up the Fraser valley from Lytton, on the main line of the Canadian Pacific, to Fort George, and thence to the Yukon district. This railway may possibly use the line of the Pacific and Great Eastern between Lillooet and Fort George as shown on the map.

The Cariboo, Barkerville and Willow River Railway has already been mentioned.

These lines, some actually under construction, some to be completed by July, 1915, and others only projected so far, but all backed by sound financial organizations, will rapidly open up this country, and afford facilities for an immense amount of immigration.

Barkerville

Wood fuel is scarce in many places throughout this area; in Fort George it costs $12 per cord, so that there will be a large market for coal for domestic use, as well as for railway consumption.

It is only a matter of time before industries are established. The mineral wealth of the country, which is reported by reliable engineers to be great, will necessitate the installation of smelters, and the coking quality of the Bear River coal will render it most valuable in this connection, if, as is probable, it gives a satisfactory coke in practice.

In this regard it may be remarked that, although the proportion of volatile matter to fixed carbon is so high that in a carboniferous coal it would at once be classed as not suitable for coking, the rules which apply to the older coals are not applicable to the more recent coals of the West, in which the volatile matter is of somewhat different constitution.

The coal of the Nicola coalfield, which has a somewhat similar analysis to this, yielded an excellent coke in a ten-ton test in Simplex by-product ovens in England.

The Bear River field is uniquely situated; while it is so far from the coast on the one side, and the prairies on the other, that it cannot compete with other coals in their markets, it has entirely to itself the market of this area, as large as Scoland, which is destined to become one of the most important parts of the country.

The nearest coal on the west which appears to be workable is the Copper River field, 350 miles away; on the east at Jasper Park, in Alberta, 200 miles distant; on the south, Nicola, over 400 miles; and on the north there is only the undeveloped Peace River field, 150 miles distant, the natural market for which will be on the prairies.

TECHNICAL WRITING—SOME SUGGESTIONS TO STUDENTS.

(Written for The Canadian Mining Journal.)

Science is well taught in Canadian universities. This is recognized far afield, for men come from Oxford and Cambridge to take the mining course at McGill, or at Queen's or at Toronto. But there is unquestionably a defect in our educational system somewhere. Whether the fault lies with the common schools or elsewhere, the fact remains that not one science undergraduate in a hundred is capable of correct literary expression. By this is not meant the niceties of "style" or fine writing; but merely the right application of grammatical rules, and the discriminating choice of words whereby the significance of the idea to be expressed is not obscured. Until the Science Faculties of the universities recognize that facility in this respect is not a "frill," but an essential, they will continue to turn out graduates imperfectly equipped to undertake one of the more important of the duties required of the engineer in active practice.

In this connection we have been granted permission to take extracts from a letter recently addressed by a well-known metallurgist to a young writer, on whose thesis, describing a smelting works, the former had been invited to pass judgment.

This letter, though reflecting the kindly nature and tolerant spirit of its author, is, nevertheless, severe enough in its comment on the loose phraseology, the inappropriate language and the ill-constructed sentences of which he finds numerous instances in the thesis in question. His criticism, however, is invariably constructive in character, and has a general application. To quote:

"The object in writing a scientific paper is to convey some definite information to some one who wants that information. Hence the information must be exact, must be new, and must be clearly conveyed."

"You have been at ———; have used your eyes and ears to good advantage, and have yourself acquired information useful to you. Your idea in writing a paper should be to pick out some part of that information which you think would be useful to others and tell about it in a clear and convincing way.

"The plant at ——— has been described many times before. You are not writing for newspapers or general readers. You are writing for metallurgists, who have already much information on the subject and who want more exact information about details. Yet you say you have purposely avoided details. The moral is, do not write unless you have definite and useful information to convey.

"The next matter to which I wish to call your attention is the use of concise, clear English. Very few scientific teachers take the trouble to impress on a boy the necessity of clear thinking and clean expression of his thoughts. Language is your only means of conveying information. You cannot pay too much attention to it. Here are a few notes on certain expressions in your paper:

" 'Roughly' is a poor substitute for 'approximately.'

"You refer to 'a conveyer which travels over the cars and the ore is thus distributed throughout the length of about 14 cars.' This is a rather clumsy way of saying, 'travels over a train of 14 cars and distributes the ore evenly throughout this train.' You see you have changed subjects in this sentence. 'Conveyer' is your first subject; 'ore' is your second subject. Don't swap horses while crossing a stream. Keep the conveyer as the subject till you get done with it.

"It's a bad plan to talk about 'drawing' a sample. Don't use a local term in a paper that goes all over the world. A sample is 'taken' everywhere. Even if in ——— they use another term.

"You remark: 'Wet and dry weights are both sent.' They are not unless you use a wheelbarrow. You mean they are 'reported' to the office.

"Again 'lay out' is another local term. That is universal. Use 'plan.'

"You attempt to tell about blast furnaces and bessemers. What do your readers want to know? A smelter man wants to know this: What kind of charging cars? How many in a train? Is ore in separate cars from coke and flux, or are all mixed in the cars? What method of charge train haulage is used? How are charges weighed? (Here you miss describing the very peculiar spring scales in use at these works). What size furnace? How high tuyeres to charge door? How high is charge kept? Is it run with a cold top or not? How much blast and at what pressure? How many jackets? (You miss describing the peculiar double tuyere on one blast pipe.) Is hearth bricked or not? What kind of spout? What is plan of settler? How is it lined? What kind of top jacket on settler? and so on.

"In talking about a stack always give top and bottom interior diameter.

"Converter slag, not converter 'skimmings.' Use general not local terms.

" 'Hissing much' sounds like a child talking about boiling oatmeal. You mean 'semi-molten mass.'

"Slag is cast in blocks; metal in ingots.

"Would it not be much better instead of confusing your readers by 'north and south' to say something like this: 'The main furnace building is (so) long and (so) wide. The furnaces are ranged end to end along one wall. The converters and casting machines along the opposite wall.' In this way you convey a clear and definite impression.

"Now about converters. How many? What size and shape? Are they bricked back of acid lining? What size mould is used? What shape? How many tuyeres? What kind of tuyere valve? How are shells lined—by hand or by tamping machine? How are they dried? How much lining is used per shell—per ton free matte and per ton copper, and so on?

"Don't talk about bullion. Bullion is any metal carrying gold or silver. Lead forms bullion. So talk about 'copper.' Then people everywhere will understand you.

"You speak of 'yellow brick.' Nobody cares if it was sky blue or rose pink. What kind of brick? Fire brick, clay brick or curdotis radial brick?

"Again you talk of 'engines a little bigger and a trifle smaller.' Be exact. It's information you are trying to convey.

"In conclusion, let me tell you a story: Some promoters financed an exploring party in the Rocky Mountains. The boys found gold. The promoters sent an expert who reported learnedly about geology and glowingly about the prospects. They were not satisfied and sent another who did the same. Finally, they sent Mickey O'Farrell, an old mill man. Mickey looked over the property and wrote:

" 'Dear Sur,—

" 'The boys hav goold alright.—Some goold, but ye'll need a pack trane av bald hedded eagles to get

yere supplies in and yer goold out, so if I was ye I wuddn't touch it. Yours trooly servant,

"'Mick O'Farel.'

"Now Mickey made a report, a good report. The experts missed the point."

EXPERIMENTAL MINE OF THE BUREAU OF MINES.

The explosibility of a mixture of coal dust and air under test conditions having been repeatedly demonstrated at the experiment station of the bureau at Pittsburgh, Pa., the Bureau of Mines is now endeavouring to determine the exact conditions under which such explosions take place in mining operations. After having failed in many efforts to find a small coal mine available for its use, the bureau obtained a tract of coal land near Bruceton, Pa., about ten miles south of Pittsburgh, and has opened there a small experimental mine for the study of coal-dust explosions. The plan of work does not contemplate the opening up of an ordinary coal mine, but rather the driving of a double entry, or tunnel, into the coal bed for about 2,000 feet and then opening, from the entries, a few rooms in which experiments may be conducted to determine, under the conditions of actual mining, the behaviour of different types of explosives, the conditions that determine the ignition of gas or dust, or mixtures of gas or dust and air, and the factors involved in the spread of the resulting explosions. The main purpose of the investigations carried on at the mine is, of course, to discover the most efficient methods of preventing such explosions. If the necessary funds can be obtained for carrying out this plan to the extent necessary for reliable results, the United States will have made an important contribution to the understanding and prevention of coal-dust explosions.

INTERNATIONAL GEOLOGICAL CONGRESS TWELTH SESSION, CANADA, 1913

PROGRAMME.

It is proposed to hold the meeting of the Congress in Toronto, beginning on or about the twenty-first day of August. The Congress will continue in session for eight days.

Topics for Discussion.

The following topics have been selected by the Executive Committee as the principal subjects for discussion:—

1. The coal resources of the world.
2. Differentiation in igneous magmas.
3. The influence of depth on the character of metalliferous deposits.
4. The origin and extent of the pre-Cambrian sedimentaries.
5. The sub-divisions, correlation and terminology of the pre-Cambrian.
6. To what extent was the Ice Age broken by interglacial periods?
7. The physical and faunal characteristics of the Palaeozoic seas with reference to the value of the recurrence of seas in establishing geologic systems.

The Coal Resources of the World.

The Executive Committee of the Eleventh Congress, held in Sweden, compiled and published a comprehensive report on the Iron Ore Resources of the World. Th prsent Excutive has undertaken the preparation of a similar monograph on the Coal Resources of the World. In order to make the work as complete as possible the co-operation of all the principal countries of the world has been invited. This invitation has met with a cordial response, and it is hoped the volumes will be ready for distribution before the meeting so that they may constitute a basis for discussion at the Congress.

Excursions.

Arrangements have been made for a series of excursions which will enable the members of the Congress to gain a knowledge of the geology and physiography as well as the mineral and other natural resources of all the more accessible portions of the Dominion of Canada. These excursions will take place before, during and after the meeting of Congress. Members will be given the opportunity of participating in one or more of the longer in addition to several of the shorter excursions.

A.— Excursions Before the Meeting .

A.1—"Maritime Provinces" (Nova Scotia and New Brunswick) Time 10 days

This excursions provides for a visit to the maritime provinces of the Atlantic Coast. Some of the chief points of geological interest in this part of Canada are: the Cambrian section at St. John; the gorge at the Grand Falls on the River St. John, both in the province of New Brunswick; the well known Joggins section of the Carboniferous of Nova Scotia; the gypsum deposits and the oil shales of the Bay of Fundy; and the Carboniferous section in Cape Breton. The coal mines and steel works at Sydney and North Sydney will also be seen. A visit will be made to one of the gold mines in Nova Scotia where the characteristic dome structure is typically developed. On the return journey the Devonian fish beds of Chaleur Bay, Quebec, will be examined. In addition one of the finest Appalachian sections in North America will be seen in the high cliffs of Gaspe.

A.2—Haliburton-Bancroft, Ontario. Time 9 days

This area lies on the margin of the Laurentian Protaxis of the North Amercia Continent, to the North of Lake Ontario. In this district is exposed the most notable section of the Grenville Series in Canada. The strata show to a remarkable degree the results of progressive metamorphism, as a consepuence of the intrusion of extensive batholiths of granite producing various types of amphibolite, etc. This district is also interesting by reason of the very extensive development of nepheline and other alkaline sycnites, some of which are of the rarer types. In certain localities these rock contain an abundance of corundum, while elsewhere sodalite, of a fine depth of colour, is conspicuous. This excursion will also include an inspection of the corundum mines and mills at Craigmont.

A.3—Sudbury-Cobalt-Porcupine, Ontario. Time 12 days

These mining areas are situated in the Laurentian Protaxis, northeast of Lake Huron. The Huronian and Keewatin systems are here very typically developed. The chief points of interest are the nickel and copper deposits of Sudbury; the iron mines of Moose Mountain; the silver mines of Cobalt; and the gold-quartz veins of Porcupine.

A.4—Niagara-Iroquois Beach, Ontario. Time 3 days

This excursion provides for a visit to the region south and west of Toronto near the shores of Lake Ontario. The Falls of Niagara and the gorge of Niagara River will be seen. The Silurian sections at Hamilton, and the ancient beach of Lake Iroquois, at Burlington Heights, will also be inspected.

A.5—Asbestos Deposits of the Province of Quebec. Time 3 days

The major portion of the world's supply of asbestos comes from the vicinity of Thetford and Black Lake in the Eastern Townships of Quebec. The quarries and mills of this area will be visited and those participating will be enabled to make a brief examination of the characteristic peridotites and resulting serpentines in which the asbestos is developed.

A.6—Anorthosite of Morin, Quebec. Time 1 day

The object of this excursion is to examine one of the typical anorthosite intrusions of the Laurentian Protaxis. These exposures lies to the north of Montreal in the neighbourhood of St. Jerome.

A.7—The Monteregian Hills, Quebec. Time 2 days

These constitute a remarkably interesting petrographical province of alkaline rocks in the immediate neighbourhood of Montreal. The nepheline syenite and essexite intrusions, which together with the accompanying dykes and sills of tinguaite, camptonite, etc., form Mount Royal, will be seen the firt day. On the second day an excursion will be made to Mount Johnson, an intrusive plug, where a gradual transition from pulaskite to a basic essexite is excellently shown.

A.8—Mineral Deposits of the Ottawa District. Time 3 days

This excursion will traverse the district to the north of the River Ottawa, between the cities of Montreal and Ottawa, and visits will be made to the principal deposits of mica, graphite and apatite in this area. The Grenville limestone at Lachute, as well as the original Eozoon locality, will be examined.

A.9—Mineral Deposits near Kingston, Ontario. Time 3 days

The region in the vicinity of Kingston, Ontario, is noteworthy for its deposits of mica, apatite, feldspar, talc, graphite, corundum, pyrite and ores of lead, zinc and iron. It is also famous for the great variety of its mineral species.

A.10—Pleistocene—Montreal and Ottawa. Time 3 days

This excursion will comprise a visit to the terraces on Mount Royal and the drift deposits at Mile End and elsewhere in the vicinity of Montreal. It will further include, in the neighbourhood of Ottawa, the fossiliferous clays at Green Creek and the terraces on the north side of the Ottawa River.

A.11—Ordovician—Montreal and Ottawa. Time 3 days

The time will be occupied in an examination of Ordovician formations exposed at various points between the cities of Montreal and Ottawa.

A.12—Southwestern Ontario. Time 3 days

This excursion, which is of especial interest to palaeontologists, provides for the study and collection of Silurian and Devonian fossils. The region embraced lies to the west of Toronto between Lakes Huron and Ontario.

B.—Excursions During the Meeting.

The arrangements provide for short excursions to various localities in the immediate neighbourhood of Toronto. Among others the following places and objects of interest will be visited.

Niagara Falls.

Glacial and Interglacial deposits in the neighbourhood of the Don Valley and at Scarboro Heights.

The Palaeozoic formations at Hamilton.

The sandstone quarries of the Credit River.

The morainic deposits north of Toronto.

The Laurentian of the Muskoka region.

The natural gas and oil fields of Ontario.

The highly fossiliferous Palaeozoic strata at Streetsville.

The clay deposits and works near Toronto.

C.—Excursions After the Meeting.

Starting from Toronto there will be four transcontinental excursions as follows:

C.1—Canadian Pacific Railway Main Line).

Time 1g days, Toronto to Vancouver, and 5 days returning Vancouver to Toronto to Montreal.

On this excursion the party will travel over the main line of the Canadian Pacific Railway, across the Great Plains and through the Cordilleran Mountain Ranges to the Pacific Ocean.

The participants in this excursion will see the nickel and copper deposits of Sudbury; the Animikie and Keeweenawan formations near Port Arthur; the Laurentian and Keewatin rocks of the Lake of the Woods; the Cretaceous and Tertiary systems of the Great Plains, with the gas wells at Medicine Hat, and the coal mines at Banff, Alberta. Arrangements will also be made for visits to Lake Louise and the Victoria Glacier at Laggan in the Rocky Mountains; the Yoho Valley; Mount Stephen at Field and the great neve at Glacier, British Columbia. The mountains of the Selkirk Range, the Coast Range batholith, and the canon of the Fraser River are the attractive features of the final stage of the journey to Vancouver.

C.2—Canadian Pacific Railway (Crowsnest Branch).

Time 15 days, Toronto to Vancouver; and 5 days returning Vancouver to Toronto or Montreal.

Those participating in this excursion will travel over the main line of the Canadian Pacific Railway directly to Medicine Hat in the Provnce of Alberta. From this point the journey is by way of the Crowsnest branch line passing through the mining centres of Lethbridge, Fernie, Nelson, Rossland and Greenwood to Midway. At Midway the party will be divided, some returning to Nelson and Revelstoke on the main line by way of Arrow Lakes. The remainder of the party will proceed to Vancouver, passing through a mining region of which the principal places are Hedley, Princeton, Tulameen and Nicola. Between Lethbridge and Fernie sections of the Cretaceous coal measures will be examined. At Frank the party will be given an opportunity of viewing a notable rock slide which occurred in 1903. West of the Kootenay River sections of the pre-Cambrian rocks of the Purcell Range will be examined, also the intrusive contact of the granodiorite

at Nelson The arrangements, moreover, include visits to the gold-copper deposits of Rossland; the gold-quartz veins of Sheep Creek; the copper mines of Phoenix and Greenwood; the silver-lead veins of the Slocan region; and the Nickel Plate gold mine at Hedley. In addition, the Oligocene coal basins at Princeton and Nicola, as well as the diamond-bearing peridotite at Tulameen, will be visited.

C.3—Canadian Northern Railway.

Time 16 days, Toronto to Vancouver; and 5 days returning Vancouver to Toronto or Montreal.

It is arranged that this excursion will cross Lakes Huron and Superior to Port Arthur. Thence the party wil lproceed by the Canadian Northern Railway across the northern part of the Great Plains to the foothills of the Rocky Mountains. Between Port Arthur and Winnipeg an examination will be made of the Atikokan iron range. A visit will be paid to Sheeprock Lake, where fossils have recently been discovered in rocks of pre-Cambrian age. At Rainy Lake the relations of the Couchiching and Keewatin may be well observed, also examples of post-glacial faulting. In the Province of Manitoba the fossiliferous Ordovician and Devonian limestones will be seen at a number of localities, while at Pine River outcrops of Cretaceous marls and limestones will be visited. The Red Deer River, in Alberta, a locality rich in dinosaurian remains, will also be examined. From Calgary to Vancouver the party will travel over the main line of the Canadian Pacific Railway.

C.4—Grand Trunk Pacific Railway.

Time 15 days, Toronto to Vancouver; 5 days returning Vancouver to Toronto or Montreal.

Proceeding y way of the Grand Trunk and the Temiskaming and Northern Ontario Railways, through the mining camps of Cobalt and Porcupine, the party will arrive at Cochrane and will thence travel over the new transcontinental line of the Grand Trunk Pacific Railway. This line of railway passes north of Lakes Abitibi and Nipigon and south of Lac Seul to Winnipeg, and continues west past Saskatoon and Edmonton and through the Yellow Head Pass of the Rocky Mountains.

Since the construction of the railway to the Pacific Coast will not be completed, the party will return to Edmonton and will thence journey by way of Calgary to Vancouver.

Between Cochrane and Winnipeg outcrops of pre-Cambrian rocks, as well as Glacial and Post-glacial deposits, will be examined at certain typical localities.

Fossil-bearing Cambro-Silurian limestones in the vicinity of Winnipeg; the coal measures at Entwhistle on the Pembina River, west of Edmonton; the coal beds at Carlsbad, and fossil-bearing Devono-Carboniferous limestones in the same locality will be among the interesting features of this excursion. It may also be noted that Mount Robson, the highest peak in the Canadian Rocky Mountains, is observable from the railway. Arrangements, moreover, may be made to descend the Fraser River to Fort George, thence to Ashcroft by automobile and on to Vancouver over the line of the Canadian Pacific Railway.

C.5—Lakes Erie and Huron. Time 14 days

The excursion through Lakes Ontario, Erie and Huron will include a visit to Niagara Falls. An opportunity also will be given for the collection and study of fossils from the Onandaga formation at Port Colborne and the Utica formation at Collingwood. In addition a visit will be made to Manitoulin Island where there are noteworthy sections of Ordovician and Silurian strata with characteristic fossils. At Pelee Island the quarries with their Devonian fossils will also be inspected.

The Archean formations and their dependent topography, as well as the very pronounced, unconformable contact between these old crystalines and the Palaeozoic, are well exemplified in the Georgian Bay district, which is included in the arrangements. Walpole Island, on which there is an Indian settlement, will also be visited. This excursion gives an excellent opportunity for stratigraphic, glacial, and physiographic studies.

C.6—Sudbury-Cobalt-Porcupine, Ontario. Time 12 days

The arrangements for this excursion are similar in all respects to those enumerated under the classification "A.3." save only that in this instance the starting point will be Toronto instead of Montreal. If necessary, provision will be made for yet another excursion to the mining regions of Northern Ontario.

C.7—Vancouver Island. Time 4 days

Starting from Vancouver, the excursion comprises a journey by steamer to Victoria, the capital of the Province of British Columbia, and thence by rail to Nanaimo, an important coal mining centre on Vancouver Island. There will be opporunity en route to observe examples of peneplanation, glacial erosion and metamorphism. After visiting the coalmines and observing the coal measures at Nanaimo, the party will return to Victoria by rail.

C.8—Yukon and Northern British Columbia. Time 23 days

Starting from Vancouver, the journey will be made by water to Skagway, Alaska, by rail over the White Horse Pass, and thence by steamboat down the Youkon River to Dawson City. The party will visit the Klondike gold field the Lewes River Valley, the Whitehorse copper district in the Yukon Territory, the Llewellyn Glacier, the Atlin gold mining district, the Skeena River mining regions, and the Portland Canal copper deposits in Northern British Columbia. A visit will also be paid to the copper and iron deposits on Texada Island in the Gulf of Georgia. The scenery on the mainland coast and islands to be observed on the passage to and from Skagway is exceptionally beautiful.

C.9—Prince Rupert and Skeena River, B.C. Time 8 days

Starting from Vancouver, this excursion permits of a sea voyage of five hundred miles along the west coast of British Columbia, which is notable for its mountains and fiords. From Prince Rupert, the terminus of the Grand Trunk Pacific Railway, the journey will be made by rail up the Skeena River Valley to Hazelton.

C.10—Athabaska and Peace River, Alberta. Time 13 days

This excursion is timed for a departure from Edmonton, coinciding with the arrival of those participating in the excursions "C.3" and C.4."

Provisional arrangements have been made as follows. The party will proceed from Edmonton to Athabaska Landing by rail, thence down the Athabaska River to Grand Rapids and Fort McMurray; and, if deemed advisable, a steamer may be chartered on to Athabasca Lake, up Peace River to Vermilion Falls; also across Athabaska Lake and down Slave River to Slave River Rapids. Economic interest in this excursion centres mainly in the area of Tar Sands along the Athabasca

River. There are, for many miles, continuous exposures of Cretaceous rocks along the upper portions of both rivers, and flat-lying Devonian limestones along the lower.

Guide Books.

Guide books for use on the excursions are now in the course of preparation.

Expenses.

A definite statement of the cost of each excursion will be issued later. Meanwhile the following generalizations may be of some practical value:—

From Europe to Toronto, via Quebec or Montreal, the cost of a ticket for the single return journey will range between $125.00 and $350.00, according to the steamer selected and the accommodation desired.

In the larger Canadian cities the charges at hotels for board and lodging vary from $2.50 per day and upward, but less expensive accommodation is obtainable at boarding houses in these cities, as well as at hotels in the smaller towns to be visited.

For the ten days of the meeting in Toronto special accommodation will be provided by the University, at a cost of about $2.00 per diem.

The value of the Canadian dollar in currencies of other countries is shown in the following table:

One dollar=Five francs, French.
" " =Four shillings, English.
" " =Four marks, German.
" " =Three kroner, seventy ore, Sweden.
" " =Five crowns, Austrian.

The active co-operation and sympathy of the various railway and steamship lines has already been generously offered.

Correspondence.

The Secretary will be pleased to answer all enquiries regarding the arrangements for the Congress. Correspondence should be addressed as follows:

The Secretary, International Geological Congress.
Victoria Memorial Museum, Ottawa, Canada.

Cable Address:—GEOCONG, OTTAWA. Messages may be sent in any of these codes:
A.B.C. 5th. Lieber, Bedford McNeil, 1908.

PROVISION FOR MINE RESCUE WORK IN BRITISH COLUMBIA

The British Columbia Department of Mines is continuing in its efforts to provide for the safety of the coal miners of the province. In this connection sites for two Government mine-rescue training stations have been secured — one at Nanaimo, on Vancouver Island, and another at Fernie, in Crow's Nest Pass district, Southeast Kootenay. Plans for the buildings have already been prepared and estimates of cost got out, so that it may be expected it will not be long before the work of erecting and equipping these stations will be undertaken. In regard to equipment, the Department of Mines now possesses a quantity of the Draeger oxygen breathing apparatus and requisite accessories, but it may be found necessary to obtain some additional equipment to make the provision for mine-rescue work ample. Of course the apparatus owned by the Government is supplementary to that the mine operators have had to provide under the law regulating the operation of the coal mines of the province.

Oxygen Apparatus in British Columbia.

The following list shows the total number of sets of the Draeger oxygen breathing apparatus and pulmotors provided at the various collieries and Government stations in the province:

	Complete Sets.
Two-hour Draeger apparatus	38
Half-hour Draeger apparatus	23
Four-hour Fluess apparatus	6
One-hour Fluess apparatus	3
Total	70

Also ten Draeger pulmotors.

Numbers of men, including Government mine inspectors, company mine officials and miners, have taken the requisite course of training to enable them to use the apparatus effectively in cases of emergency. Fortunately few such have arisen in the province since the provision of the apparatus and training of men in mine-rescue work, though the great value of the pulmotor for resuscitating those overcome by inhaling noxious gas has been demonstrated in several instances.

Mine-Rescue Training at Nanaimo.

It is gratifying to find that interest in mine-rescue training work is being well maintained at Nanaimo. The Western Fuel Company, recognizing the urgent necessity that exists for the protection of the lives of miners, so far as it is possible to make provision for their safety, was the first company in British Columbia to obtain oxygen breathing apparatus, and to its credit it should be noted that it did this before the enactment of the now existing law making provision of such apparatus by coal mine operators compulsory. Mr. Thomas R. Stockett, manager, and Mr. Thomas Graham, general superintendent, did all in their power to induce miners in the employ of the company to take the requisite training course so as to be ready, if occasion should arise, to use the apparatus in rescue work, and thus endeavor to save the lives of any men in danger in the mine should a disaster occur. For nearly two years training work has been going on at the station established by the company near the headworks of its No. 1 mine, Esplanade, Nanaimo. In February of 1911, on the occasion of a meeting of the Western Branch of the Canadian Mining Institute being held at Nanaimo, there was made at that station for the information of the visitors a demonstration of actual training in mine-rescue work. Throughout the year the training work was continued, under the direction of Mr. Graham. On January 1 of the current year he became Chief Inspector of Mines for British Columbia, and was succeeded as superintendent of the collieries by Mr. Thos. McGuickie, who also fully realizes the value of having a sufficiently large number of men trained in the use of the oxygen apparatus, so is keeping up interest in the training work.

On May 10 there was held in Nanaimo an interesting gathering, which took the form of a smoker, the chief purpose having been the presentation of certificates of competency in mine-rescue work to a number of memebrs of the Western Fuel Company's mine-rescue corps. Among those present was the manager, Mr. Stoekett, and other company officials; also, Mr. Graham, Chief Inspector of Mines. The certificates are suitable lithographs on parchment, ornamented with the figure of a man wearing oxygen breathing apparatus; the text attests the fact that the man whose name is on the certificate has passed the requisite course of training and is competent accordingly. There were 42 of the certificates presented. The full number of men belonging to this corps who have passed as efficient in mine-rescue work is 62, but one man has since died, so the strength of the corps is now 61. This includes all the company's mine officials physically fitted to undergo the course of training, which is by no means light, and a sufficient number of the miners to make the proportion of those competent to undertake mine-rescue work four per cent. of the total number of the company's underground employees.

It is to be hoped the excellent example set by the Western Fuel Company in this direction will be followed by at least all the larger operating companies, so that all possible provision will thus be made for the protection of the lives of the miners. The great importance of the insistence of the Provincial Government on the provision of mine-rescue apparatus and the co-operation of the mine operators in making its use of real service in case of necessity, will be more apparent when it is remembered that in 1910 the number of men and boys employed in the coal mines of the province was 7,758, of which total 5,903 were employed underground. As the output of coal is increasing, it follows that the number of underground employees is becoming proportionately larger, so that the need for protection of the lives of between 6,000 and 7,000 miners and other underground employees is evident and one that may not be disregarded.

PORTLAND CANAL MINING COMPANY, B.C.

The fourth annual general meeting of shareholders in the Portland Canal Mining Company, Limited, which was opened at Victoria, British Columbia, on December 28, 1911, and adjourned pending continuance of negotiations for amalgamation of the company with other interests, was continued on April 26th. Included in the accounts submitted to the meeting was a revenue account showing a total expenditure during the fiscal year ended October 31, 1911, of $83,332.48, and receipts of $18,673.55, practically all from net proceeds of concentrates sold, which left a debit balance on revenue account of $64,658.93.

The directors reported to the adjourned meeting that as mining and concentrating operations to be profitable would have to be on much larger scale than had been practicable under existing conditions, an amalgamation of several neighbouring properties had been under negotiation with Toronto capitalists, but as the necessary working capital had not been forthcoming, this proposal had had to be abandoned. However, while two of the directors and the general manager were in Toronto in March, negotiations with the representative of a large British company had been commenced and a definite proposal made to the directors. This proposal, if carried into effect, would provide for making available the requisite working capital, and the eventual liquidation of the company's debenture debt, besides leaving the shareholders a good interest in the property. The directors stated that if the various properties it is proposed shall be amalgamated satisfy the engineer examining them on behalf of the British company concerned, and be taken over by that company, the Portland Canal Company's position will be decidedly better than it is at the present time. It was pointed out that for some time past the directors have been personally contributing substantial amounts to meet the company's liabilities until such time as some arrangement shall be made that will be to the advantage of the shareholders.

The report of the company's general manager, Mr. W. J. Elmendorf, showed that delay had taken place last year in obtaining delivery of the machinery and plant for enlargement of the concentrating mill to a capacity of 80 tons daily, which delay had seriously hampered the company. During the whole period the concentrator was operated about 7,000 tons of ore had been milled and approximately 2,100 tons of concentrates produced, of which 1,700 tons had been shipped and the remaining 400 tons loaded ready for shipment shortly. The average assay value of the ore sent to the mill had, however, fallen considerably. After careful experiments it was found that as mining had been carried on to the south and upward toward the surface the porphyritic gangue in the ore had increased in quantity, replacing the quartz, and that while the former rock was often well mineralized with pyrite and galena, these sulphides contained but small percentages of gold and silver. By the time this had been determined it was too late to mine away from the dike from which the intruded sheets of porphyry were off-shoots, for new stopes could not be quickly opened and the mine still maintain its full capacity output of about 100 tons a day. It was also not possible to break the ore free from the porphyry, as it was generally most intimately mixed. Then the travelling cable of the upper part of the aerial tramway became so worn as to be unsafe for use. Under the circumstances, and with winter approaching, it was decided to suspend operations pending making provision for working on a larger scale.

The manager said further, in his report: "The mine is by no means worked out. At the time we closed down it was producing about 100 tons a day with about 30 men in the mine. The porphyry dike is well defined on the surface and future development in the mine can be away from it. Its extent and position are even better shown by the underground workings and, apparently, the faces of both Nos. 2 and 3 drifts are beyond it. Drifting to the south will probably disclose new ore and the completion of the Max raise to the surface at what is known as the Upper Open Cut will, in all probability, put more than 200 feet of ore in shape to stope. The face of this raise is now in ore, and there is 8 feet in width of ore in the Upper

Typical Scenes—Portland Canal Mining District, B.C.

Open Cut. I am as strongly as ever of opinion that the mine is a good property and will be worked at a profit with further development. . . . With a larger basis of operations, extensive development of the vein or veins, increased milling capacity, and better facilities for mining, milling, and transportation, it is reasonable to expect a successful outcome to this enterprise, and ultimately a large and profitable mine. All this depends, without doubt, upon the opening of large ore-bodies of profitable grade, but I have yet to hear the first unfavourable opinion on this point from any competent engineer acquainted with the properties, and many such, including some men eminent in the profession, have visited these mines."

The reports and statement of accounts were adopted, and the following directors were re-elected:—Messrs. C. H. Dickie, J. A. Mara, J. R. Waghorn, A. Von Alvensleben, H. Martin, and T. A. Wood.

SLIME TREATMENT.

At the plant of the Lord Nelson gold mine, St. Arnaud, Victoria, erected last year, slime from old dumps, containing 28 grains of gold to the ton, and slime from the mill containing 24 to 40 grains per ton are being treated. The slime from the mill consists of overflow from a classifier and from sand collecting vats. This amounts to about one ton per hour, carried in suspension in 8,000 gallons of water per hour.

The pulp is thickened in a simple settling tank to a consistency of from 1 to 1¼ of water to 1 of dry slime. There is a continuous flow of the thickened pulp which is raised by air lift directly to the agitation vats. The clean overflow from the settling tank is divided into two streams, one stream being piped to the residue sump below the filters, and the other being delivered to a reservoir.

Although the old dumps contain considerable amounts of sand mixed with the slime, no difficulty is experienced in treatment, and no effort is made to size the material. It is found that a reasonable amount of fine sand mixed with the slime accelerates filtration.

Alloyed with steel, the elements carbon, nickel, and silicon yield compounds of great resistance to oxidation and corrosion. Steels carrying from 3.4 to 26 per cent. of nickel are much less susceptible to corrosion than are unalloyed steels. Tests made recently in which steel discs were immersed for long periods in fresh water, in salt water, and in sulphuric acid of different strengths, show that alloys of high nickel content have a remarkable resisting power.

In a letter to the "Engineering and Mining Journal" Mr. J. Parke Channing gives particulars of a device for the prevention of accidents in the case of overwinding in inclines, in use at the Burra Burra mine, at Ducktown, Tenn. The shaft here is of three compartments, sunk at an angle of 80 degrees from the horizontal. In the hoisting compartment two 5-ton skips are operated and between each skip and the hoisting drum is interposed a Humble disengaging hook. When overwinding occurs a copper pin is sheared, the skip hangs up and the end of the rope with its corresponding connection is freed. On the one occasion of overwinding at this shaft, the device worked successfully and within an hour the skip was again in working order.

CANADIAN MINING INSTITUTE.

At the recent annual meeting of the Canadian Mining Institute a resolution was adopted by which the secretary was instructed to communicate with the authorities to urge again that rescue apparatus for use in mines be admitted into Canada free of duty. At present such appliance is apparently classified under "machinery composed wholly or in part of iron and steel, not otherwise specified," and as such is subject to a duty of 15 per cent., if of British manufacture, 25 per cent., under the Intermediate Tariff, and 27½ per cent. under the General Tariff. Since most of the rescue apparatus imported is of German manufacture it is taxed at the higher rate. Mining machinery of a class or kind not made in Canada is admitted duty free; so are lifeboats and "life-saving apparatus imported by societies, to encourage the saving of human life." Mine rescue apparatus is not manufactured in Canada; it is for use in mines; obviously it is imported with a view to the saving of human life. Two or more years ago the Mining Institute brought the same matter to the attention of the Dominion Government, and received the assurance that mine rescue apparatus would be placed on the free list. It wasn't. The authorities now assert that they cannot act on the suggestion to classify mine rescue apparatus under "life-saving apparatus" or "machinery not manufactured in Canada," which would be a simple way of getting round a difficulty, if there is one; but add, that "the request will be laid before the Tariff Commission when appointed, as a change in the tariff would be required to meet the views of the Institute." This is a very fine sample of red-tape. As a matter of fact importers of rescue apparatus can now obtain a rebate of the duty by applying to Ottawa for it, which shows that the authorities sympathize with the importers' point of view. Mine rescue apparatus is not specifically mentioned in the tariff schedule. Hence to the mere outsider it would appear the simpliest thing in the world to make a ruling that would settle the question and satisfy everybody. Since this is not so, importers must be content to wait until the "matter has received the consideration of the tariff commission," which has yet to be appointed.

SIMPLE READING DEVICE FOR BURETTES.

A small mirror placed behind a burette admits of very accurate readings by bringing the meniscus in direct line with its reflection. A fine horizontal diamond scratch on the mirror renders the readings extremely accurate.

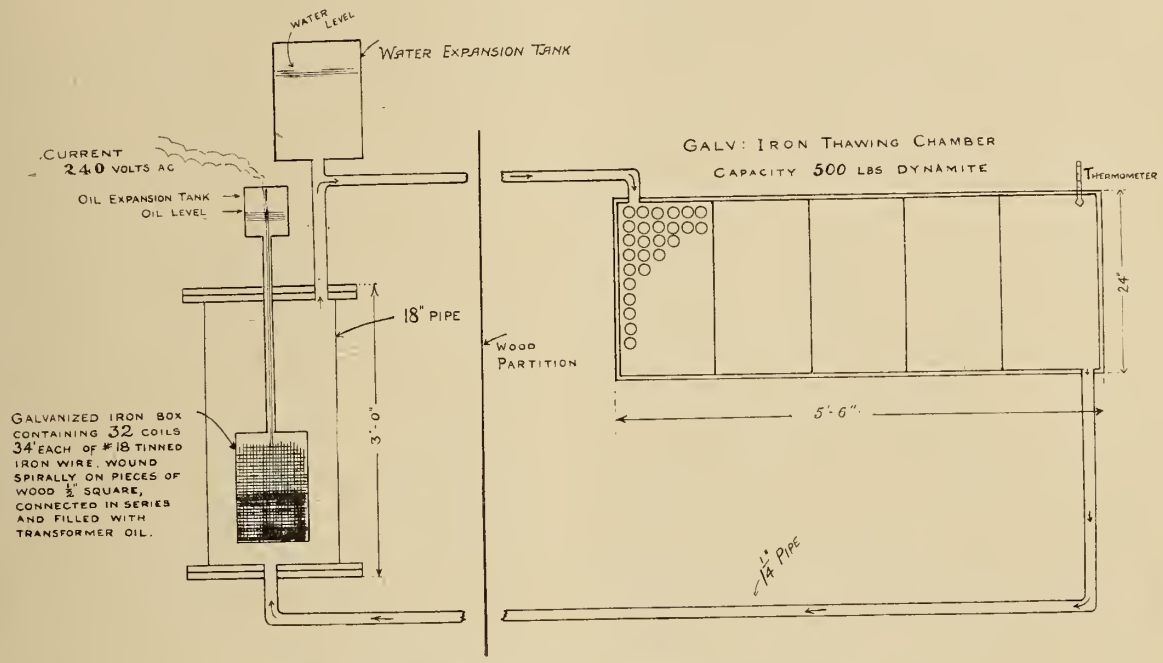
AIR LIFT AGITATION OF PULP SLIME.

When slime is treated with sufficient lime to neutralize the ferrous sulphate and sulphuric acid the former is precipitated as ferrous hydroxide, which at once absorbs all the oxygen in the slime, and only a small percentage of which is changed into ferric hydroxide. Air lift agitation quickly introduces more oxygen, and at once changes the ferrous hydroxide into ferric hydroxide, and introduces the excess of oxygen, which is necessary for perfect conditions in cyaniding.

A SIMPLE DYNAMITE THAWER

Contributed by W. H. DeBlois.*

The accompanying sketch shows our underground dynamite thawer, which overcomes the objections to thawers operated by means of electricity and meets with the full approval of our Provincial Mine Inspector. The thawing chamber consists of a galvanized iron box divided for convenience into several compartments provided with padlocks. The heater was made from an old piece of 18-inch steel pipe, flanged top and bottom. Inside of this is a galvanized iron box containing the resistance coils and filled with transformer oil. The heater is about six feet distant from the thawing chamber and is separated there-



Apparatus for Thawing Dynamite by Water Electrically Heated

from by a partition. Using current at the rate of 1½ k.w. a temperature of about 83 deg. F. is maintained in the thawing chamber, which thaws the dynamite evenly and completely in about three hours. The circulation of warm water is, of course, aided by having the heater somewhat below the level of the thawing chamber.

In view of the increasing use of electricity in mines, this thawer provides a very convenient substitute for steam.

RAPID ESTIMATION OF ZINC.

The process is briefly as follows:—One to three grams of the zinc ore are dissolved in a mixture of 10 c.c. of nitric acid (density 1.2) and 20-30 c.c. of hydrochloric acid (density 1.9), preferably in a porcelain dish, so that the siliceous mass may be broken up with a pestle. After boiling for a while on a sand-bath, the whole is rinsed into a 200 c.c. flask, 50-60 c.c. of ammonia are added, and the solution is again boiled for a short time. When cold, dilute ammonia (1 : 3) is added up to the mark, and the solution is well shaken and filtered. One hundred c.c. of the filtrate are mixed with a little bromine water to precipitate any manganese, and the turbid liquid is then boiled with about one gram of aluminium scrapings until the copper present is all precipitated. Five c.c. of sodium sulphite solution (1 : 4) and a few c.c. of dilute ammonia are added, the liquid is again heated to boiling, and at once filtered; the residue is washed with a hot dilute ammoniacal solution of sodium sulphite.

The filtrate is neutralized with hydrochloric acid, and an extra 10 c.c. of dilute acid (1 : 3) is then added. After diluting to 150 c.c. and heating to boiling, the zinc is at once titrated with ferro cyanide (21.63 grams of potassium ferro cyanide and 14 grams of crystallized sodium sulphite per litre), using ammonium molydate solution (9 grams per litre) as external indicator. The end reaction is shown by the formation of a reddish-brown spot.

*Superintendent The Nichols Chemical Company, Limited, Sulphide, Ont.

MACHINE STOPING AT SIMMER DEEP.

At the Simmer Deep mine on the Rand 66.5 per cent. of the tonnage mined was broken by machines last year, as against 49.7 per cent. in 1910. Notwithstanding this extended machine stoping, it was found possible to keep an average stoping width of 57½ inches, which corresponds to the actual width mined on the basis of tonnage removed from stope faces. More ore by 101,000 tons was mined last year than in the preceding twelve months. By means of small rock drills of the hammer type it is hoped eventually to compete successfully with hammer boys in cost as well as in width of stoping.

SPECIAL CORRESPONDENCE

ONTARIO

PORCUPINE AND SWASTIKA.

The new ore body at the Davidson property, on which the final payment has just been made by the Crown Chartered Company, has been developed for 30 feet. A cross-cut has shown that the ore body when first struck was at least 20 feet wide, and, according to the channel samples taken, this promises to be all good pay ore. Work is at present confined to opening up another level at 200 feet, and both the old and the new ore body should be opened up this month as the plant is now running very smoothly.

The shaft at the Mulholland property in Whitney township is down to 170 feet, and will be continued to 200 feet. Work is being done by hand, and a plant will not be installed until better showings warrant the outlay.

It is stated that the Foley-O'Brien is to resume operations. In the meantime the council of South Porcupine want to secure one of the shafts as a source of water supply and application has been made to use some of its acreage as a burial ground.

Of all the outlying townships where assessment work is being done the best results are reported from Turnbull. Sampling has shown that values are fairly consistent and the veins are large enough to warrant further investigation.

An examination of the Rea mine has been made by the new directors and their technical advisers. An attempt will undoubtedly be made to re-finance the company and resume work.

It is understood that an attempt is being made to merge the two power companies—the one operating and the other preparing to operate in the Porcupine camp. If the merger were effected the Porcupine camp would have at its service between 11,000 and 12,000 horse power. The Timmins-McMartin-Dunlap syndicate controls the Sandy Falls plant, which is now delivering power; and a Montreal syndicate, of which Mr. Lorne McGibbon is president, has control of the Waiwaiten plant, which should be completed about August.

Owing to the delay in the delivery of machinery the Vipond mill will probably not be running till the early days of next month. The construction of the mill is almost completed.

While the Hollinger mill has made great headway during the past month, there is much yet to be done, and it is not probable that the first run will be made until well into June.

It is reported that the Dome Lake mill will be completed in August. The mill run of ore at the Kingston School of Mines was very satisfactory to the management.

Quite a number of prospectors are travelling east from Cochrane to the Harricanaw River and are following it north to a new field found during the winter. Quartz veins carrying coarse gold are being stripped, but it is reported that so far the pay streak is narrow.

COBALT NIPISSING.

The April report of the Nipissing Mining Company is of more than usual interest, inasmuch as it gives in addition to the development of the month a resume of the work undertaken and work planned by the company.

The shipments during the month of April amounted to $229,682, and the production during the same period totalled $225,145, all net. Of the latter amount No. 73 shaft contributed $184,271. The best development of the month was at vein 122. In putting up a raise from the intermediate raise from the first level, ore was encountered about sixty feet from the surface. A drift was started on this ore and is in to the shoot twelve feet. There is ore in the back and in the bottom of the drift and up the face the entire nine feet in height. The width of the vein in the face averages six inches and the ore will assay about 5,000 ounces. This promises to be the best development on vein 122 since the original ore body was found two years ago.

At shaft 73, the fault which has thrown the vein throughout these workings has been encountered in the east drift. A cross-cut has been started to pick up the vein above the fault.

Some idea of the low-grade ore to be encountered in the Nipissing workings may be inferred from this month's development on the third level of the Meyer. The sides of the drift have been scaled off and this work shows that there are a number of stringers in some places ten to twelve feet away from the main vein and all this ground will probably make good mill rock. The shaft will be sunk further and another level opened up, as it is believed that the conglomerate is dipping steeply to the east.

The main shaft at 64 has reached a depth of 343 feet. This shaft is being sunk purely for exploration purposes and is outside of the vein in the Keewatin. Some drifting was done on the fourth level and a raise was put through to the third level, but without favourable results.

Cross-cuts are being run from the second level of the shaft 73 towards the La Rose shaft and towards the Cobalt Lake, to prospect the hill on which the north end of the town is situated. A cross-cut over 700 feet long has been driven down Argentite Street, almost to Cobalt Station. The only result was the cutting of one calcite vein.

The old Kendall vein has definitely resigned first place among the Nipissing producers to the Meyer and little ore is now being taken out of it. A cross-cut from it 697 feet long has been run down the Little Silver Hill with the result that several stringers have been picked up and these will be investigated.

The high-grade mill treated 147 tons of ore during the month and shipped over $200,000 of bullion.

Good progress has been made with the construction of the low-grade mill. The battery building is now up and the framework completed over the tube mill building. The concrete foundations for the wall are all in. A considerable portion of machinery is already on the ground.

COBALT TOWNSITE.

The Cobalt Townsite Mining Company occupies a unique position; it is the one company operating in Northern Ontario and controlled by English capital that has paid a dividend; furthermore, it has only obtained that position this year, though it has been operating since 1906. A shaft was sunk and small shipments made from an ore body near the southwest corner of the property, but in 1908 the mine was closed down and so remained for about six months. Work was resumed under the mine management of Mr. John

Redington, who first saw and developed the possibilities of the northeast corner of the property. He was succeeded by Mr. C. E. Watson, who is consulting engineer for the company, but the mine has been nursed into the position of a dividend earner by Mr. A. C. Bailey, who has been in charge now since Mr. C. E. Watson left the camp for Porcupine. At the present time the Cobalt Townsite is employing about 180 men, of whom 110 are working in the mine, 50 on the surface, and 20 on construction.

The weekly production of the mine is slightly in excess of 30,000 oz. of silver, which at present price of silver is worth approximately $17,000 per week. The weekly expenses run in the neighbourhood of $5,000.

The company is treating 75 tons a day of low-grade at the Northern Customs mill under contract, having some years to run. About a year and a half ago the Northern Customs Company built an extension to its mill for the exclusive use of the Townsite Company and this extension contained 20 stamps. Shortly afterwards the Townsite Company found it necessary to arrange for the use of ten additional stamps, or a total capacity of 75 tons a day of low-grade. At the present time work is being pushed rapidly for a further extension of the mill to contain twenty additional stamps for the use of the mine, to be completed about the 1st of August next. The Townsite Company will then have in operation fifty stamps treating 125 tons of ore a day.

Present developments underground have been chiefly in the neighbourhood of No. 1 shaft, situate at the northeast corner of the property, but a new shaft and ore house have just been completed on the shaft known as No. 2 and situated about 200 yards west of shaft No. 1, and are now in operation. The principal developments are on the 100-foot level and the 200-foot level, where the formation is conglomerate and slates. No. 2 shaft is designed for handling rock and ore from the 100-foot level, as developments have been so extensive that it has been found impossible to satisfactorily handle the ore from both levels from the one shaft.

The company is also mining the south boundary from the Right of Way workings, having leased the southerly shaft, ore house, etc., of the Right of Way Company, and are engaged in taking out ore from two veins which run into the Townsite property along the boundary line of the Right of Way Company.

Considerable diamond drilling has recently been done on the property, which it is understood has shown the conglomerate formation to be considerably deeper than anticipated, and it is now proposed to re-open the old shaft situated near the southwest corner of the property to cross-cut two veins of high-grade at the 100-foot level. The core from a diamond drill working in this vicinity showed silver believed to be from these veins.

It will be noted from the weekly shipments returns of the camp that the Townsite mine stands fifth in point of tonnage for this year, and in this connection it must be borne in mind that with the exception of slimes from the picking belt and from the mill, nothing has been shipped this year except high-grade ore and concentrates.

The management consider they have enough high-grade and low-grade ore blocked out and in sight to maintain the present rate of production for at least two years.

The Canadian company, is, of course, really an operating company, all the shares being owned by an English company of similar name with head office in London. The shares of the latter company are listed on the London Stock Exchange and are held almost exclusively in Great Britain, France and Belgium.

Since the first of January, 1912, dividends have been paid in England, amounting in all to 15 per cent. At the annual meeting held in London in January last it was announced that a quarterly dividend of 5 per cent. would be paid, and, in addition to the two quarterly dividends, a 5 per cent. each in January and May. Two bonuses aggregating 5 per cent. have also been paid.

At the present time a winze is being sunk for the purpose of making a new level at a depth of about 275 feet, at the main shaft diamond drill tests having proven the formation to continue at least to this depth. The past two or three years the direction of the affairs of the company have been in charge of a board of directors, most of whom are Toronto men, with Mr. W. R. P. Parker as president, Mr. J. P. Watson as vice-president.

BRITISH COLUMBIA

It is noteworthy that for the first time in recent years a dividend has been paid by a mining company operating in Slocan district, namely the Standard Silver-Lead Mining Company, which owns the Standard group of mineral claims, situated in Four-Mile Camp, near Silverton, Slocan Lake. This company was organized late in 1910; it acquired the mining property previously owned and developed by Messrs. J. A. Finch, of Spokane, Washington, and Geo. H. Aylard, of New Denver, B.C., and last year it constructed an aerial tramway from the mine down to the mill-site near the shore of the lake, put in a water system to supply water for power and concentrating purposes, installed a compressor plant with an air line to convey compressed air to the mine, erected and equipped a concentrating mill, and late in the year commenced to ship sorted crude ore and silver-lead concentrate to the smeltery at Trail. Since then profits have been accumulated until, in April, a first dividend was declared on the authorized capital of $2,000,000. The total amount of this first dividend was $25,000; it is intended to pay $50,000 in May, and each following month, at which latter rate the dividend will be equivalent to a distribution of 30 per cent. per annum. There are other mines in Slocan district which are expected to ere long be again on the dividend-paying list—notably the Rambler-Carbioo, which has much ore developed awaiting the construction of an aerial tramway down to its new mill-site, the erection of the mill, and the completion of the branch railway line from the C.P.R. Co.'s Nakusp-Sandon railway.

Outlook for Granby Company.

The following is an excerpt from "Walker's Weekly Copper Letter," published in the "Boston Commercial" of May 12:

"Granby directors have authorized the management to begin work immediately on the construction of a 2,000-ton daily capacity smeltery at the Hidden Creek property. Other construction will include an electric railway from the mine to the smeltery and thence to the docks. The ore haul will be about a mile and the distance from the smeltery site to the docks is a little less. Hydro-electric power, sufficient for all uses at mine and smeltery, will be developed on a stream near by.

"No arrangement for new financing has been made. The company has enough money to proceed with the development of the mine, construct the railroad and docks, and put in foundations for the new plant. Meanwhile it is earning approximately $100,000 a month. It is probable the entire new plant will be paid for out of operating profits.

"Diamond drilling and development work have proved Hidden Creek ore-bodies to be both larger and higher in grade than they were believed to be when the property was purchased. More than 12,000,000 tons of self-fluxing smelting ore, which will average over two per cent. copper and contains 30 cents a ton in gold, has been demonstrated.

"It is figured that the company will make copper at Hidden Creek cheaper than it does at Phoenix and Grand Forks. Mining costs will be about the same; but there will be a saving of 23 cents a ton one ore transportation, and only half as much coke will be required to smelt a given tonnage of ore. The cost of transporting a ton of bullion to the eastern refineries will be 50 cents less than it is from Grand Forks.

"The new plant, which will cost $1,700,000, will be completed within 18 months to two years. It is expected to turn out 30,000,000 lbs. of copper annually, giving Granby a total yearly production of 45,000,000 to 50,000,000 lbs.

"General Manager Graves says Granby is now treating a larger tonnage of ore at Grand Forks—more than 3,500 tons daily—than ever before, and at lower cost per ton. This ore yields about 18½ lbs. of copper and 75 cents in gold and silver per ton. He says the future outlook for Granby is brighter, and that its assets are worth more than at any previous time in the company's history.

"I figure that when Granby gets itself into a position where it can produce 45,000,000 lbs. of copper annually at a cost of ten cents, it will earn $18 a share yearly on a 16-cent market, or $9 on 13-cent copper."

Motherlode Sheep Creek Mining Company.

Announcement has been made that crushing ore was commenced at the Motherlode Sheep Creek Mining Company's new mill at Sheep Creek, Nelson mining division, on May 4. As this is the first mill fully equipped with modern gold-saving appliances established in Kootenay, it marks an advance in gold-milling practice in that district.

Three years ago Mr. Wm. Watson, of New York, a well-known mining engineer, (brother of Mr. Raoul Watson, of La Rose and Nipissing mines, Cobalt), examined and reported on the Motherlode property, then only a prospect. Later he undertook the development of the property for his principals, chief among whom is Mr. John McMartin, known as being prominently connected with Nipissing, La Rose, Hollinger, and other important mines in Northern Ontario. The Motherlode mine was developed to a depth of 500 ft. below the ore outcrop, and it was thereafter decided that there was a sufficiently large quantity of ore available to warrant the erection and equipment of an up-to-date stamp mill and cyanide plant. First, though, bulk samples of the ore were submitted experimentally to various treatment methods so as to determine which would be the most advantageous to adopt for this particular ore. The provision of the requisite gold-saving facilities was commenced last summer, but as the winter was far advanced before the mill and all auxiliary plant were completed, it was decided to wait until spring before turning water in to the stave-pipe line, which might have been damaged by the sharp frosts of winter had an attempt been made to use it during that part of the year.

Beside the 10-stamp mill, an aerial tramway 3,600 ft. long, with a difference of about 1,000 ft. between elevations of terminals, was constructed; also water lines for power purposes. The water system includes two red fir continuous stave pipe lines conveying water to a 7,000-ft. line of steel pipe graded from 16 to 14-inch in diameter, which delivers water at the mill at an average effective pressure of 600-ft. head. Power is obtained from six specially designed Pelton water-wheels, which drive all mill machinery, and a compressor having a capacity of 1,440 cubic feet of free air per min.

The mill and cyanide plant include Blake crusher, ten 1250-lb. stamps, Merrill's patent sizing cones, tube mill, amalgamating plates, Dorr continuous thickeners, Aldrick slime pumps, four 8x25 ft. Pachuca tanks, cyanide vats, Merrill's clarifying and precipitation presses, and a full complement of accessories. The erection of the building and arrangement of plant have been carried out so as to allow of the addition of five more stamps and another tube mill at comparatively small further cost. The best talent available has been employed in designing and equipping the mill, which it is believed will prove to be one of the best gold-savers in the world. It is estimated that there is about three years' supply of ore blocked out. Altogether a successful and profitable outcome of this enterprise is confidently looked for.

Late advices from Montreal are to the effect that Mr. Henry Timmins has joined the directorate of the Motherlode Sheep Creek Mining Company, stock in which is now being quoted in the New York market.

General Mining Notes.

At the Standard mine, Slocan, the raise from No. 6 to No. 5 level has been completed. Another level, 750 ft. vertical depth below No. 6, is being extended and a little ore is being met with in the drift.

Attention is being given to several mining properties in the South Belt of Rossland camp, where the Blue Bird and Richmond claims, among others, are being developed with encouraging results.

The development of the Red Cliff copper property, in Portland Canal mining division, is being continued. Reports of the intention of the Red Cliff Company to ship ore to a smeltery are again being circulated.

In the Coast district, the Britannia is making a comparatively large output of copper ore and concentrate, which is being shipped to the smeltery at Tacoma, Puget Sound, Washington, for treatment. A bigger output is being prepared for.

It has been estimated by the United States Geological Survey that Alaska mines produced 22,000,000 lbs. of copper in 1911. This is by far the largest output of this metal ever made in one year by Alaska, and it is due to the fact that the production of copper has been commenced at mines in the Copper River district and to an increased output from mines in Prince William Sound district. The Copper River railway was completed to the Bonanza mine, and shipment of ore was begun, in April, 1911, and was continued throughout the year. There was also a marked increase in output of the mines of the Prince William Sound district.

GENERAL MINING NEWS

NOVA SCOTIA.

Scheelite, Halifax Co.—Mr. Victor Hills has resigned the position of manager of the tungsten mine at this place and Mr. A. L. McCallum, B.Sc., is in charge of operations. Mr. McCallum is a graduate of McGill and has had long experience in Nova Scotia. For some years he has conducted a consulting practice in Halifax, where he also runs an assay office. On several occasions he has been called upon to carry on important investigations for the Nova Scotian Government and for large corporations.

Halifax.—It is announced that the Wabana installation of the Nova Scotia Steel & Coal Company is now about completed, and a very large amount of the ore mined now is coming from the submarine areas, and this portion is being increased every week. The equipment installed has been pronounced by many engineers to be unequalled for simplicity and efficiency, and is furnishing ore at an extremely low cost of production.

Advices from the company's plant at New Glasgow indicate that business is unusually good and that the prospects are for a record year for the company.

QUEBEC.

Montreal.—A suit which involves a block of 569,960 shares of the Crown Reserve was heard by Mr. Justice Demers on May 20th and taken en delibere. John Black et al. formed the syndicate who originally owned this property and are the plaintiffs in the present suit against the company.

It appears that when the company was formed the present Crown Reserve property at Cobalt was acquired from a syndicate composed of the six plaintiffs who now figure in the case, and others, and it is claimed that, apart from allocations of stock made in favor of each member of the original syndicate, a stock of 569,950 shares was set aside to be transferred by the trustees of the syndicate to the directors of the company for the purpose of providing funds for the organization of the company and for working capital as the directors might deem prudent from time to time.

Of this number of shares, 338,807 have been disposed of to date, leaving a balance of 231,143 still in the hands of the directors for the purposes above specified.

The plaintiffs maintain that the flourishing condition of the company, which, with its reserve of $750,000, has earned more than double of the capitalization of the company, puts an end to the trust whereby these shares were held by the directors and that the directors in fairnss cannot claim that they require any further working capital. Hence they claim that the residue of 231,143 shares should be distributed pro rata among the original members of the syndicate.

The company on the other hand contend that the members of the original syndicate in accepting the allocations of stock coming to them gave a discharge to the trustees of the original syndicate which amounted to a discharge in favour of the company, and that in consequence they have no proprietary right to the shares involved in the suit. Moreover, even if they were to be considered as having any such proprietary right, the company points out that the properties are not fully developed and consequently there may be further calls upon the working capital represented by the shares.

ONTARIO.

Toronto.—The property, plant and concentrating mill of the Nova Scotia Silver Cobalt Company was offered for sale at public auction on May 20th, and was disposed of to the highest bidder, D. M. Steindler, of New York, for $82,000, an amount equal to about 33 1-3 per cent. of the current liabilities.

The purchaser was the president of the defunct company and appeared with his associates as one of the biggest creditors holding notes, etc., against the concern to the amount of $145,098.

Scotia Cobalt has a capital paid up of $2,500,000. The directors were D. M. Steindler, president, New York; M. B. Davis, vice-president, Montreal; J. A. Jacobs, Montreal; A. M. Reaper, Montreal; L. A. Bayley, Montreal. From time to time the company found very rich ore on its property, but these turned out on subsequent development, to be rich pockets.

Toronto, May 22.—The Pearl Lake Gold Mines will not have to go under the hammer after all, it being announced that a deal has been closed with New York and Philadelphia capitalists to finance the property and pay its debts.

The debts of the company, which were reported to be about $100,000 in all, have been provided for and will be paid off by funds provided by the purchasers of the controlling interest.

A sufficient amount has been lodged with Mr. G. T. Clarkson, the assignee in charge, to liquidate the pressing indebtedness at once, and the remainder will be cleared up in the near future.

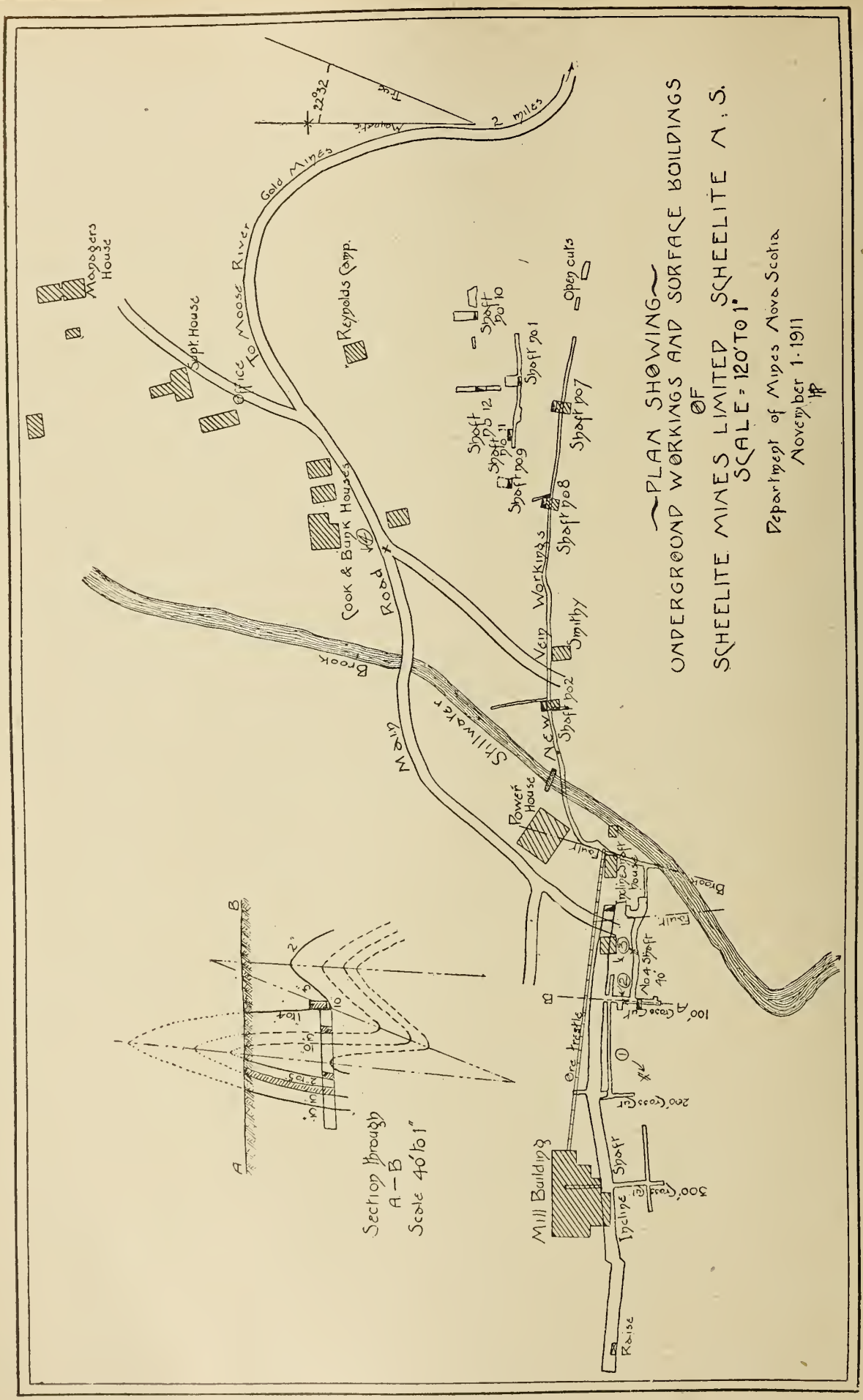
Burr E. Cartwright, the present president of the company, will be retained on the board, but his interest will be a minority one only, as he has sold control to the new interests.

Pearl Lake property is very well regarded, and has the deepest shaft in Porcupine.

Cobalt, May 16.—Returns have just been obtained from the first carload of concentrates despatched from the new mill at the Beaver and, as the practice here is a new departure in the camp, they are important. The mill, which is treating on an average about 60 tons per day, was constructed at a cost of $48,000, and in place of the stamps uses the Hardinge ball and pebble mills as fine grinders. The concentrates shipped to the Deloro smelter ran 1,300 ounces to the ton and the management state that the thirty-three tons netted them $20,000. There is also on hand at the mine now from a half to two-thirds of another car ready for shipment.

Ore is being raised for the mill and for shipment direct from four levels, the lowest of these being the 500-foot. The lowest actual level is at 530 feet, where a smaltite vein is being drifted upon with good prospects of running into a shoot of ore soon. About half of the Beaver silver comes from high-grade and half from concentrates.

Cobalt.—The construction of a mile of aerial tramway between the Savage and the McKinley-Darragh for transporting to the McKinley-Darragh mill the milling rock from the Savage dumps will be begun within a few weeks.



(See over leaf)

The tramway will be one of the biggest undertakings that the McKinley-Darragh has attempted. A single span of 800 feet will be necessary at Cart Lake just before the Savage end of the line is reached and the ore will have to be taken over a high hill that intervenes between the two properties.

The rock at the Savage, which is to be treated at the McKinley-Darragh low-grade mill, has been accumulating for two years and now amounts to more than 20,000 tons. All of this rock averages 20 ounces to the ton at least and much of it runs more than that. The tramway was devised as a substitute for a low-grade mill which has for some time been projected for the Savage property. The fact that the McKinley-Darragh mill can handle the rock has changed the plans of the management, however, and substituted the tramway idea in place of the more expensive plan of building an additional mill. The structure will cost $20,000 and will require about three months to build.

Cobalt.—A start has been made with the construction of the addition to the Northern Customs Concentrator plant at Cobalt, where, by August, the company expects to have forty more stamps dropping, bringing the full battery up to 120 stamps. Upon this extension the company is spending $75,000.

Haileybury.—It has been decided to make the mill for the Casey-Cobalt a ten-stamp mill. The original plans were for a five-stamp mill, but the recent developments at the property are held to justify the building of a mill of double that capacity. A large portion of the machinery has already been brought in for the mill and the balance will be delivered inside of three weeks. Construction has been started on the building and the foundations for the motors are finished. The mill will have 10-standard 1250-pound stamps and the new patent Isbell vanners are to be installed. This vanner is also being tried out at the Northern Customs concentrator in Cobalt. A large amount of ore has been blocked out at the mine in readiness for the mill. Additions are also being made to the operating plant at the Casey-Cobalt. The order has been placed for an eight-drill steam-driven Sullivan compressor. Work at the Casey so far has been done with two small three-drill machines and these are to be retained as auxiliaries when the new machine is in use.

Cobalt, May 25.—Over thirty prospectors have left here during the past few days for Massey at the Soo branch, in response to a call for prospectors sent to town on Tuesday that gold has been discovered in that section. A larger gang of men will leave to-day for the new fields, while other towns in the district will also send their quota of prospectors to the new fields. Little is known in Haileybury of the finds, but the prospectors are all obeying the impulse to go in on the ground floor, if it is any good.

Porcupine, May 20.—Plans for the building of the Dome Lake Mines' stamp mill and tube-mills are out, and ground is being broken for the basement of the structure.

Ten stamps will be operated with tube-mills, which give an added capacity of ten stamps, a total of 100 tons every 24 hours.

The Dome Lake's property consists of three 40-acre claims adjoining the West Dome on the South, and two claims southwest of the Big Dome. Manager McKenzie is in charge of the work.

The new compressor plant of the style and pattern of the Dome Extension outfit, is being installed and will be ready for operation within two weeks. Forty men are employed.

YUKON.

A despatch received from the Yukon states that seven out of a total equipment of nine dredges are now in commission. There is an abundance of water and the boats are operating entirely satisfactorily. In all probability dredge No. 8 has begun operating by this time.

The first boat was placed in commission on May 3rd. The average start for the boats last year was May 6th. Although some of the dredges last year began operating earlier than this year, owing to the number of boats which were placed in commission this year, the start is in reality an earlier one.

During 1911 the Yukon made net profits of $1,313,450. As this fell somewhat short of the dividend which was being paid at that time, which called for approximately $1,400,000 per annum, the company in December reduced the rate from 8 per cent. to 6 per cent., the present disbursement calling for $1,050,000. The decrease in earnings for 1911 from those of 1910 of $1,400,000 was due to an extraordinarily dry season resulting in a scarcity of water which reduced the length of the dredging season. It was expected in 1911 that a considerable increase would be shown over the figures for 1910.

COMPANY NOTES

Crown Reserve Dividend.

The Crown Reserve Company has declared a dividend to-day of 2 per cent. with a bonus of 3 per cent. payable June 15th, to shareholders of record May 31st. Books will not close.

The Jupiter Report.

At the annual meeting of Jupiter Mines, Limited, held in Toronto on May 20th, President T. H. Hamilton said, in part:

"Operations on a serious scale began on the first of June last, and have been pushed along as rapidly as has been economically possible. We have two series of veins on which shafts have been sunk 200 and 300 feet. One series is evidently very rich; the other series, which is not so rich, makes up for this in quantity. Our endeavour has been to find ore and put it into an economical condition for extraction, and I am able to tell you that during the past year we have justified our actions in expenditures.

"I am convinced in my own mind that we have a very valuable property, and we have every reason to believe that the next six months will afford us sufficient data to warrant the installation of a modern plant. Our endeavour has been to carry operations on underground with all possible speed and to keep down expenditures on the surface to the lowest possible point, and thereby to put as large a tonnage of ore in sight as possible at a minimum expense.

"So far as the present market value of our shares is concerned, I may say that it is a matter that does not interest us in the slightest degree. We have, we believe, a very bright 'prospect' in the Jupiter, and we are devoting our whole attention to developing the property along thoroughly sound lines, which course, we believe, our shareholders will endorse."

The report of the consulting engineer, R. W. Brigstocke, said, in part:

"The work done on the Jupiter Mines has been naturally of an exploratory nature only, specially planned and carried out with the object of proving the existence of profitable ore. This exploration has been most encouraging. The No. 1 series of veins have been opened up at the 50, 100 and 200-foot levels, and at each level profitable ore has been found. The No. 2 series of veins have been opened up at the 100,200 and 300-foot levels. On the 100-foot level 20 feet of profitable ore was cut, but owing to the proximity of the lake, very little underground exploration was attempted. On the 200 and 300-foot levels, there is every evidence of the extension of this ore body, which is most gratifying.

"No. 1 series of veins indicates a width of three feet, and a value of $2 to $25 per ton in gold. The other series indicate greater widths and $10 per ton in value.

"The rocks are soft and the ground will be mined very cheaply. A very good indication of this is the amount of work accomplished underground, namely, 3,000 feet for less than $100,000, including surface expenditures on buildings and equipment.

"It is a very interesting detail, but a fact that phenomenally rich ore exists in the Jupiter mine. Assays of samples, properly cut across the vein, have given in a great many cases, extraordinary results, and while it is somewhat dangerous to lay too much stress on the results of such samples, they must, when properly taken, be reckoned with.

"In arriving at the average of assay values, results of samples of extraordinary richness have been excluded.

"Everything looks well for the Jupiter, and if expenditures are made along reasonable and sane directions, the outcome will be gratifying."

STATISTICS AND RETURNS

NOVA SCOTIAN COAL SHIPMENTS.

Springhill Collieries (Dom. Coal Co.).

Shipments, April, 1912	29.941
Shipments, April, 1911	6,162
Increase, April, 1912	23,779
Shipments, 4 months, 1912	118,710
Shipments, 4 months, 1911	25,562
Increase, 4 months, 1912	93,148

Inverness Railway & Coal Company.

Shipments, April, 1912	21,970
Shipments, April, 1911	14,565
Increase, April, 1912	7,405
Shipments, 4 months, 1912	82.918
Shipments, 4 months, 1911	76,475
Increase, 4 months, 1912	6,443

Acadia Coal Company.

Shipments, April, 1912	30,144
Shipments, April, 1911	31,267
Decrease, April, 1912	1,123
Shipments, 4 months, 1912	118,636
Shipments, 4 months, 1911	123,489
Decrease, 4 months, 1912	4,853

Nova Scotia Steel & Coal Company, Limited.

Shipments, April, 1912	51,109
Shipments, April, 1911	25,041
Increase, April, 1911	26,068
Shipments, 4 months, 1912	153,173
Shipments, 4 months, 1911	108,496
Increase, 4 months, 1912	44,677

Intercolonial Coal Company.

Shipments, April, 1912	16,476
Shipments, April, 1911	20,477
Decrease, April, 1912	4,001
Shipments, 4 months, 1912	71,687
Shipments, 4 months, 1911	83,837
Decrease, 4 months, 1912	12,150

Cobalt Ore Shipments.

Only seven mines shipped ore from Cobalt last week, almost as many shipping bullion. Ore shipments for week and year in pounds of ore are:

	Week May 17	Year to date.
Beaver	.....	250,658
Buffalo	61,400	947,754
Can. Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers-Ferland	.....	323,500
Cobalt Lake	.....	351,198
Cobalt Townsite	60,795	1,061.329
Colonial	.....	83,200
Coniagas	.....	1,533,573
Crown Reserve	.....	422.104
Drummond	.....	604,000
Hudson Bay	125,493	626,290
Kerr Lake	40,203	657,223
La Rose	129,211	2,625.021
Mann (Gowganda)	.....	40,000
McKinley	53,942	1,986,820
Millerett	.....	156,000
Miller Lake-O'Brien	.....	146,500
Nipissing	.....	1,629.300
O'Brien	.....	526,898
Provincial	.....	44,440
Right of Way	.....	290,296
Temiskaming	83,514	833,199

Trethewey		326,999
Wettlaufer		216,470
Totals	454,565	16,624,753

Bullion shipments for the week:

	Ounces.	Value.
Kerr Lake	2,774	$ 1,702
Nipissing	76,490	56,403
O'Brien	15,598	10,787
Buffalo	75,000	45,000
Crown Reserve	6,060	3,272
Colonial	1,698	1,018
Totals	110,110	$77,683

Both bullion and ore shipments from the local mines for the week ending May 25th were small. Coniagas and the Nipissing each shipped large quantities, but the rest of the mines were below the usual quantities. La Rose, McKinley-Darragh, Chambers-Ferland and the Crown Reserve were the only other mines that sent out ore.

The shipments for the week were:—

	Ounces	Value
Nipissing	30,222	$18,548.74
McKinley-Darragh	7,799	4,679.00
	38,021	23,227.74

	1912.	1911.
Nipissing	$1,483,651.72	$854,937.46
Crown Reserve	207,203.00	115,951.19
Temiskaming	56,833.00	33,804.96
O'Brien	88,433.01	50,964.00
Nova Scotia	49,010.00	31,800.00
Buffalo	38,938.00	22,714.54
McKinley-Darragh	10,327.00	6,069.37
Kerr Lake	7,240.25	4,381.21
Trethewey	5,703.66	3,238.00
City of Cobalt	1,618.40	1,000.00
Colonial	1,698.00	1,018.00
Miscellaneous	16,268.81	10,798.64
Totals	$1,966,924.85	$1,136,677.37

The shipments for the week and year in tons to date are as follows:—

	Week May 25.	Total.
La Rose	31.13	1,279.31
Coniagas	74.05	771.80
O'Brien	.....	263.24
Right of Way	.....	148.60
Chambers-Ferland	32.00	193.60
McKinley-Darragh	38.02	1,020.63
Nipissing	97.17	792.61
Hudson Bay	.....	312.62
Buffalo	.....	412.57
Crown Reserve	28.50	219.43
Cobalt Townsite	.....	505.28
City of Cobalt	.....	14.84
Trethewey	.....	174.19
Colonial	.....	41.60
Kerr Lake	.....	319.66
Cobalt Lake	.....	176.26
Drummond	.....	300.32
Temiskaming	.....	320.64
Beaver	.....	132.34
Wettlaufer	.....	111.21
Provincial	.....	22.22
Casey Cobalt	.....	24.50
Totals	290.87	7,556.47

BRITISH COLUMBIA ORE SHIPMENTS.

The United Copper mine at Chewelah, Wash., made its first shipment to Trail last week. The ore of this property is a high grade silver-copper ore, principally grey copper.

The Emma mine also made a shipment to Trail of ore running high in iron to determine its value for fluxing purposes.

The Lucky Boy also made its first shipment. The Richmond-Eureka made its first shipment since the big slide which tied up the railroad at the Payne tunnel.

The matte shipments were 92 tons valued at $66,249 for the week.

The Boundary shipments were well up to the record breaking tonnage of this year. The Granby shipped 528,000 pounds of blister copper, making 8,338,500 pounds for the year to date.

The Consolidated Company's receipts are:

	Week	Year to date
Rossland—		
Centre Star	3,739	58,639
Le Roi	1,258	18,393
Le Roi No. 2	322	11,185
Blue Bird	....	57
I. X. L.	....	12
East Kootenay—		
Sullivan	644	10,678
St. Eugene	....	401
Society Girl	....	21
Slocan—		
Standard	....	3,318
Van Roi	31	1,326
Hewitt	34	124
Ottawa	....	28
Eastmont	....	51
Fidelity	....	61
Apex	....	36
Richmond-Eureka	87	550
Rambler-Cariboo	26	497
Reco	....	24
Lone Bachelor	....	31
Ruth	....	259
Middleton	....	24
Molly Hughes	....	7
Lucky Boy	21	21
Other mines	....	228
Nelson—		
Arlington	....	970
Granite-Poorman	....	132
Queen	....	110
Emerald	....	880
Molly Gibson	74	827
Other Mines	....	132
Monarch (Field)	31	239
Emma (Eholt)	57	57
Foreign—		
Knob Hill	....	1,445
United Copper	35	35
Other mines	....	164
Total	6,356	113,918
Granby Smelter Receipts—		
Granby	25,305	464,121
B. C. Copper Company's Receipts—		
Mother Lode	8,096	147,644
Rawhide	5,937	70,032
Emma	....	4,650
Athelstan	....	357
Jackpot	357	6,912
Unnamed	140	3,498
Total	14,530	233,093

GENERAL MARKET.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

May 21—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $2.40 to $2.50 per ton.
Foundry coke, prompt, $2.75 per ton.
May 21—Tin, Straits, 45.80 cents.
Copper, Prime Lake, 16.50 cents.
Electrolytic copper, 16.37½ cents.
Copper wire, 17.25 cents.
Lead, 4.20 cents.
Spelter, 6.92½ cents.
Sheet zinc (f.o.b. smelter), 8.65 cents.
Antimony, Cookson's, 8.00 cents.
Aluminium, 21.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $45.50 per ounce.
Platinum, hard, $48.00 per ounce.
Bismuth, $1.80 to 2.00 per lb.
Quicksilver, $41.00 per 75-lb. flask.

TORONTO MARKETS.

May 23.—(Quotations from Canada Metal Co., Toronto):
Spelter, 6.50 cents per lb.
Lead, 4.50 cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 47 cents per lb.
Copper, casting, 16.50 cents per lb.
Electrolytic, 16.50 cents per lb.
Ingot brass, 7 to 12 cents per lb.
May 23—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Summerlee No 2, $2250 (fo.b. Toronto).
Midland No 1, $19.75 to $20.50 (f.o.b. Toronto).
Midland No. 2, $19.75 to $20.50 (f.o.b. Toronto).

SHARE MARKET

(Courtesy of J. P. Bickell & Co., May 27th.)

New York Curb.

	Bid.	Ask.
Braden	6¼	6⅜
B. C. Copper	5	5¼
Butte Coal		
Giroux	5⅝	5¾
Greene-Cananea	9½	9¾
Inspiration	19⅛	19¼
Yukon Gold	3⅜	3½
Goldfield Cons.	4⅛	4¼
Nevada Cons.	42	42⅛
Miami	26⅛	26¼
Ray Cons.	29½	30
Chino	18⅞	19
United Copper	¾	1¼

Cobalt Stocks.

	Bid.	Ask.
Bailey	2	2⅛
Beaver Cons.	46	47
Buffalo	..	155
Chambers-Ferland	17	17½
City of Cobalt	17	17½
Cobalt Lake	24½	25½
Coniagas	700	....
Crown Reserve	310	330
Great Northern	9¾	10¼
Gould	3⅛	3½
Gifford	4	4⅛¼
Green-Meehan	1⅜	1½
Hargraves	5½	6
Kerr Lake	250	260
La Rose	345	350
McKinley-Darragh	175	178
Nipissing	770	780
Nova Scotia	No Market.	
Ophir	8	12
Otisse	1¾	2
Peterson	6¾	7½
Right of Way	9½	10½
Silver Leaf	5½	6
Silver Queen	2	4
Temiskaming	39½	40
Trethewey	55	60
Wettlaufer	**60**	63

Porcupine Stocks.

	Bid.	Ask.
Apex	.03	.04¼
Dobie	.34	.38
Crown Chartered	.16½	.17½
Dome Extension	.35½	.36¼
Eldorado	.04	.06
Foley-O'Brien	.18	.25
Hollinger	10.75	10.90
Jupiter	.31	.33
Moneta	.19	.15
Nor. Ontario Exp.	2.00	3.00
North Dome	.50	1.00
Pearl Lake	.16	.17
Porcupine Central	No Market.	
Porcupine Imperial	.02	.02⅝
Porcupine Northern	No Market.	
Porcupine Tisdale	.02	.02⅛
Porcupine Southern	No Market.	
Preston East Dome	.05	.05½
Rea Mines	.35	.45
Standard	.04¾	.05½
Swastika	16½	.17½
Vipond	.40	.41
United	.01½	.02½
West Dome	.14	.25
American Goldfields	No Market.	

SILVER PRICES.

		New York cents	London pence
May	8	60½	27⅞
"	9	60⅜	27 13/16
"	10	60⅜	27 13/16
"	11	60½	27⅞
"	13	60⅞	28 1/16
"	14	60⅝	27 15/16
"	15	60¾	28
"	16	61⅜	28¼
"	17	61⅜	28¼
"	18	61¼	28 3/16
"	20	61⅜	28¼
"	21	61⅜	28¼

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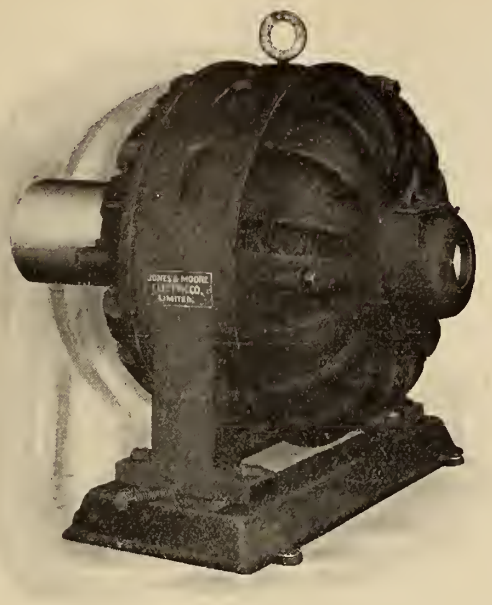

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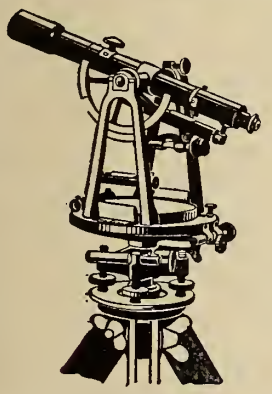

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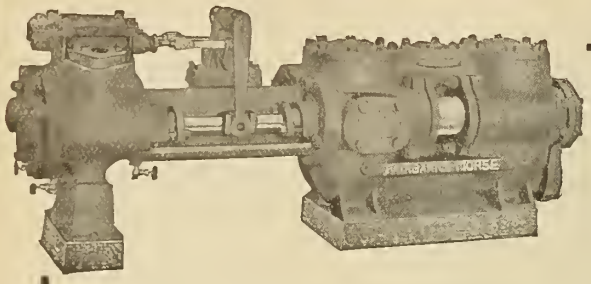

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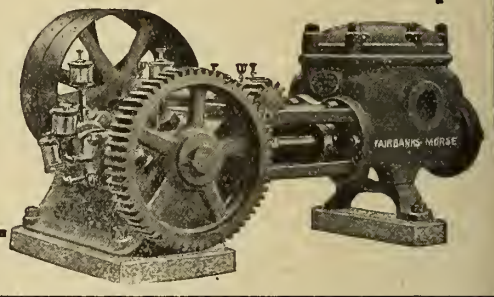

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

REPORTS RECENTLY ISSUED:

CANADA

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

NEW BRUNSWICK and NOVA SCOTIA

1113. Memoir No. 16. The Clay and Shale Deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele.

QUEBEC

1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

ONTARIO

1137. Memoir No. 10. An instrumental survey of the shore lines of the extinct lakes Algonquin and Nipissing in South-western Ontario, by J. W. Goldwait.

1213. Memoir No. 28. The Geology of Steeprock Lake, Ontario, by Andrew C. Lawson. Notes on Fossils from Limestone of Steeprock Lake, Ontario, by Charles D. Walcott.

NORTH WEST PROVINCES

1115. Memoir No. 8. The Edmonton Coal Field, Alberta, with maps, by D. B. Dowling.

1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

BRITISH COLUMBIA

1139. Memoir 11-T. Triangulation and Spirit Levelling of Vancouver Island, 1909, by R. H. Chapman.

YUKON and NORTH WEST TERRITORIES

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.

1130. Memoir No. 9. Bighorn Coal Basin, Alberta, by G. S. Malloch, accompanied by a map.

MAPS RECENTLY ISSUED:

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1042. Mineral Map of Canada. Scale 100 miles to 1 inch.

1084. Geological Map of Canada. Scale 100 miles to 1 inch.

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1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

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1155. Map 24A. Millstream Iron Deposit, Gloucester County, N.B., geological and topographical. Scale 400 feet to 1 inch.

1156. Map 25A. Nipissiguit Iron Deposit, Gloucester County, N.B., geology and topography, scale 400 feet to 1 inch.

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1112. Map 12A. Vicinity of the Trancontinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.

1180. Map 34A. Vicinity of the National Transcontinental Railway, between the counties of Levis and Temiscouata, Quebec. Scale 8 miles to 1 inch.

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1091. Map 8A. Lake Nipigon, Thunder Bay District, Ontario. Scale 4 miles to 1 inch.

ALBERTA

1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

BRITISH COLUMBIA

792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.

1123. Map 17A. Southern Vancouver Island, British Columbia. Scale 6 miles to 1 inch.

1198. Map 48A. Tulameen Coal Area, Yale District, B.C. Scale ½-mile to 1 inch.

1136. Map 16A. Phoenix, British Columbia, geological. Scale 400 feet to 1 inch.

1148. Map 20A. Victoria sheet, Vancouver Island, B.C., topographical. Scale 1 mile to 1 inch.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

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Aggregate Value of $374,197,650

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Total Value for 1910, $26,377,066

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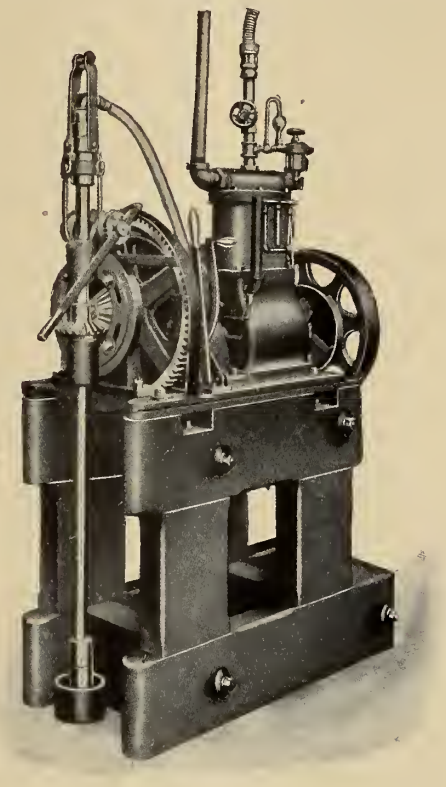

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The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The silver mines of the Cobalt district have astonished the world by their richness, and promising gold discoveries have recently been made in Porcupine Lake.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. W. H. HEARST,
Minister of Lands, Forests and Mines,

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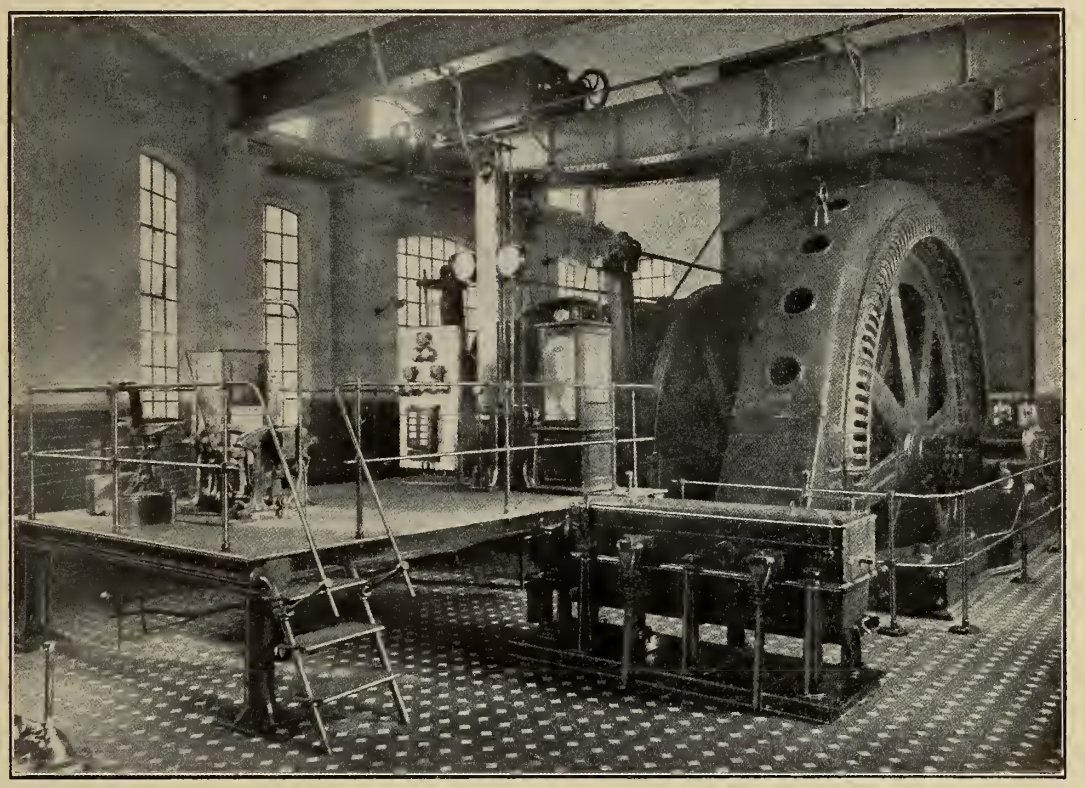

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Waterous Engine Works Co.
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Mussens, Limited.
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Siemens Brothers. Dynamo Works, Ltd.
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Ejectors—
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M. Beatty & Sons.
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Jenckes Machine Co.
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Mussens, Limited.
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W. F. Stanley & Co.
Peacock Bros.
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Peacock Bros.
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Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
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Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
Engines—Haulage—
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.
Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Engines—Oil—
Jenckes Machine Co.
Peacock Bros.
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Continued on page 36.

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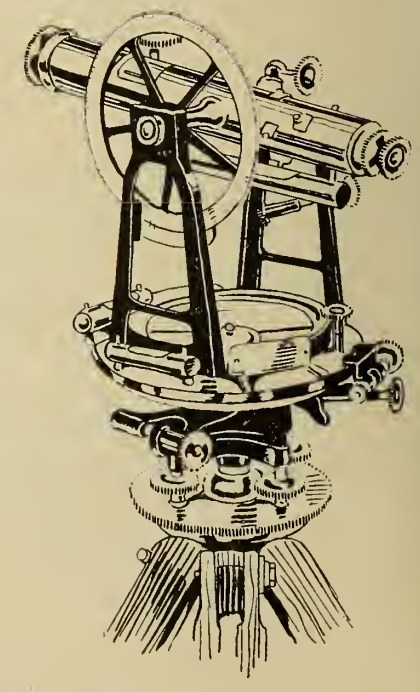

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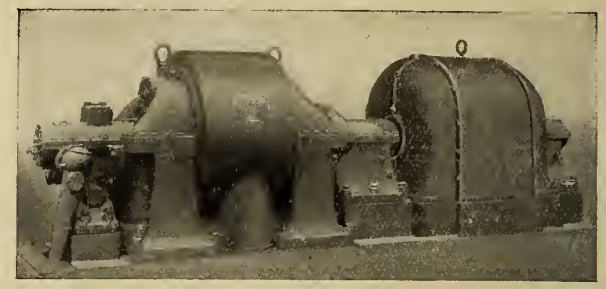

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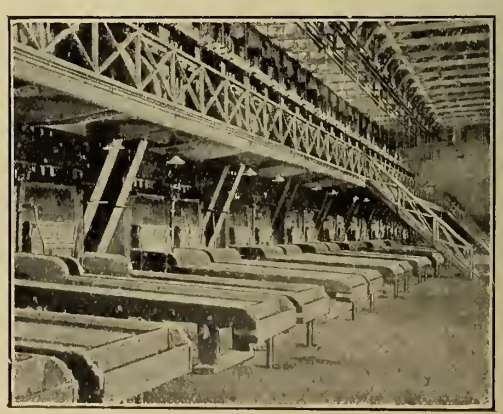

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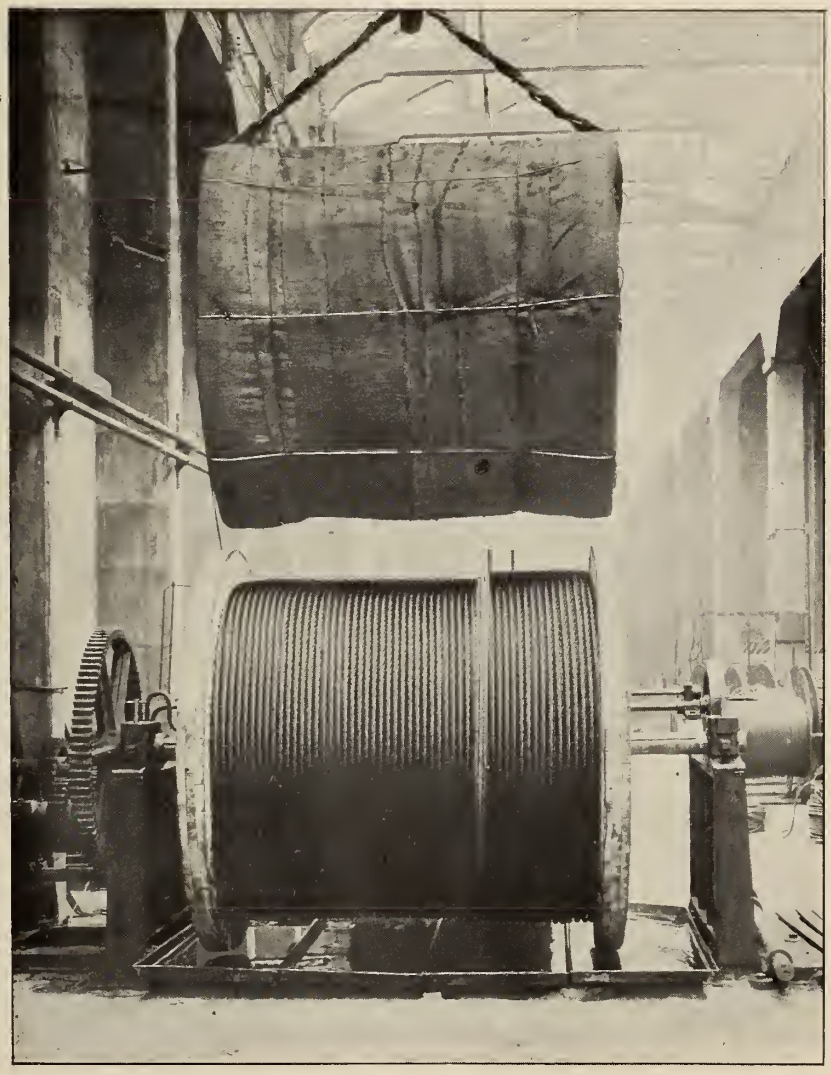

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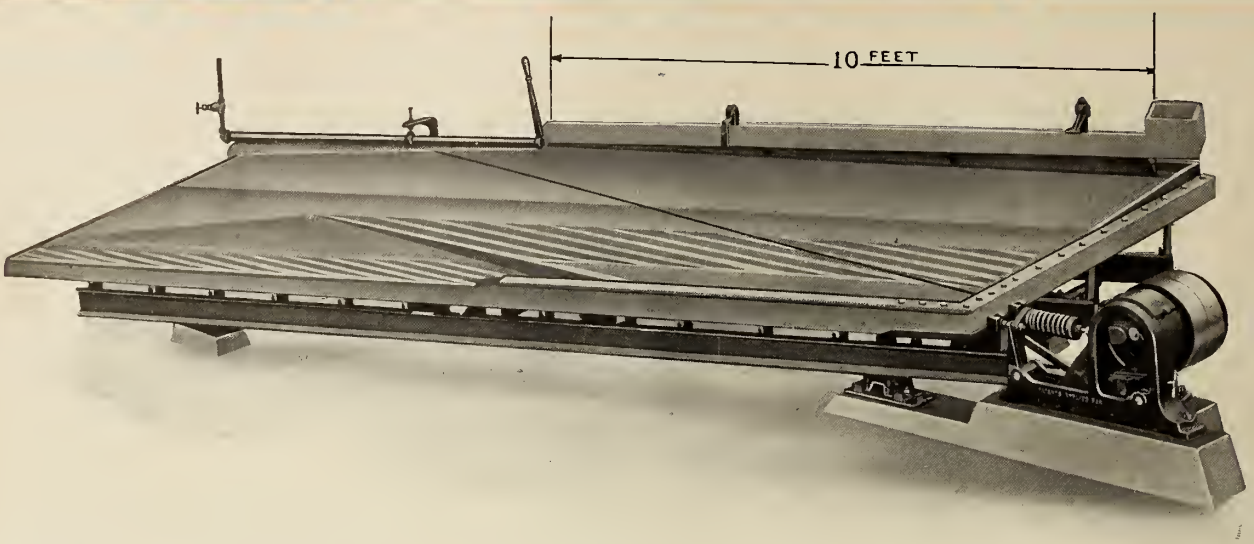

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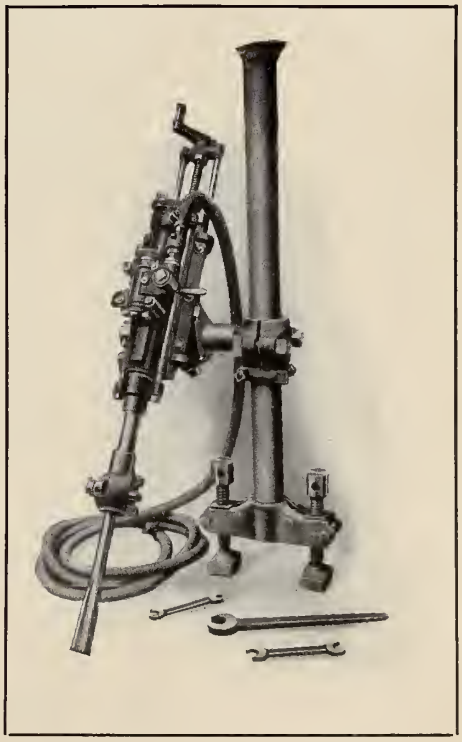

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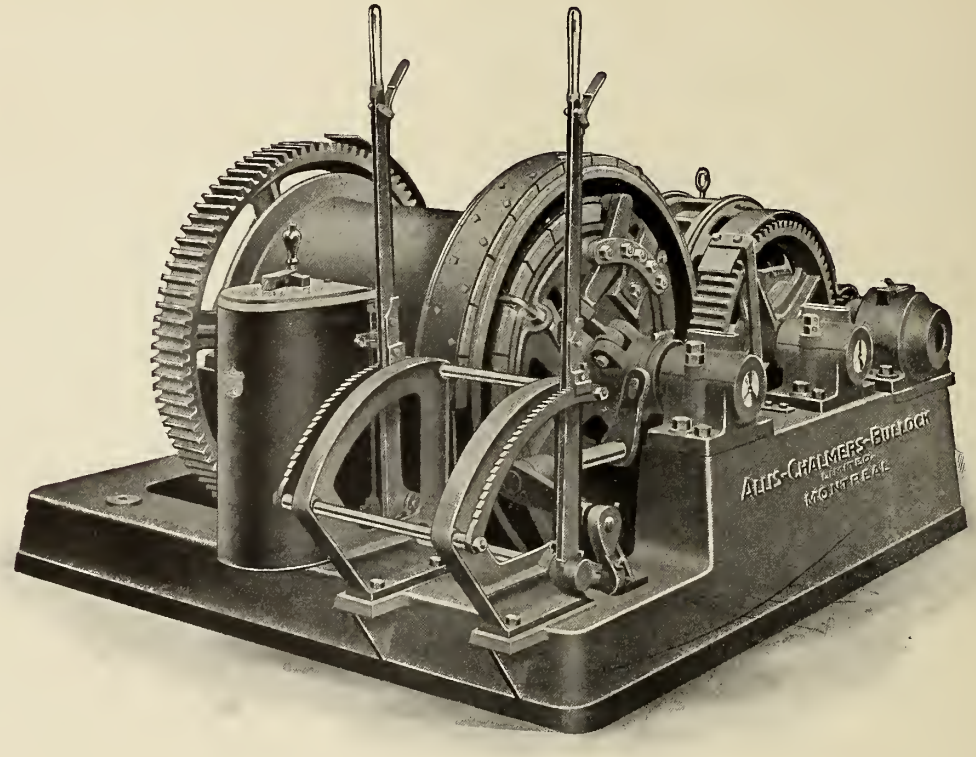

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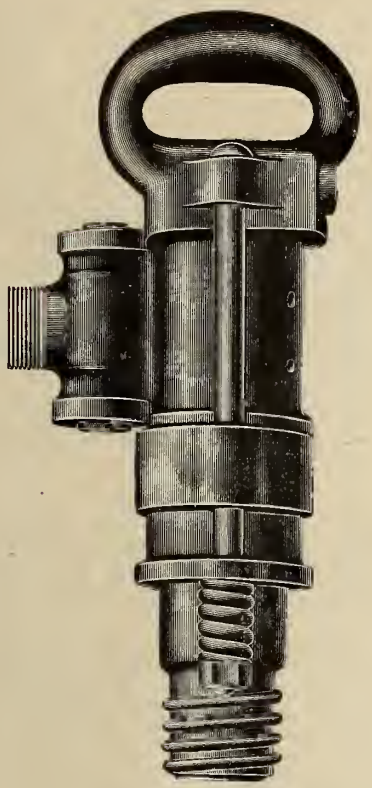

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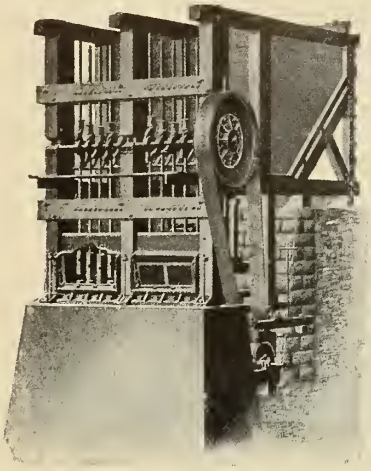

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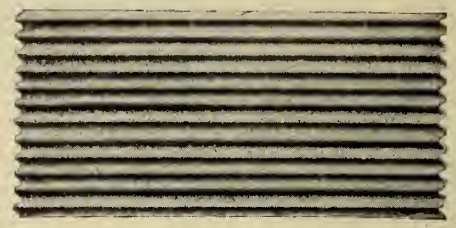

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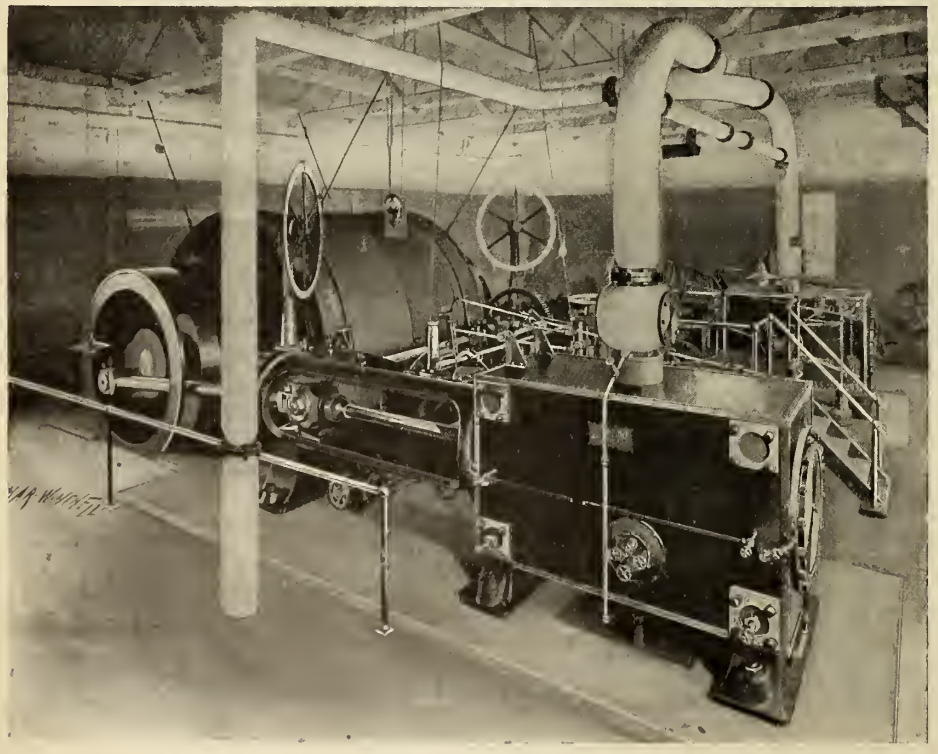

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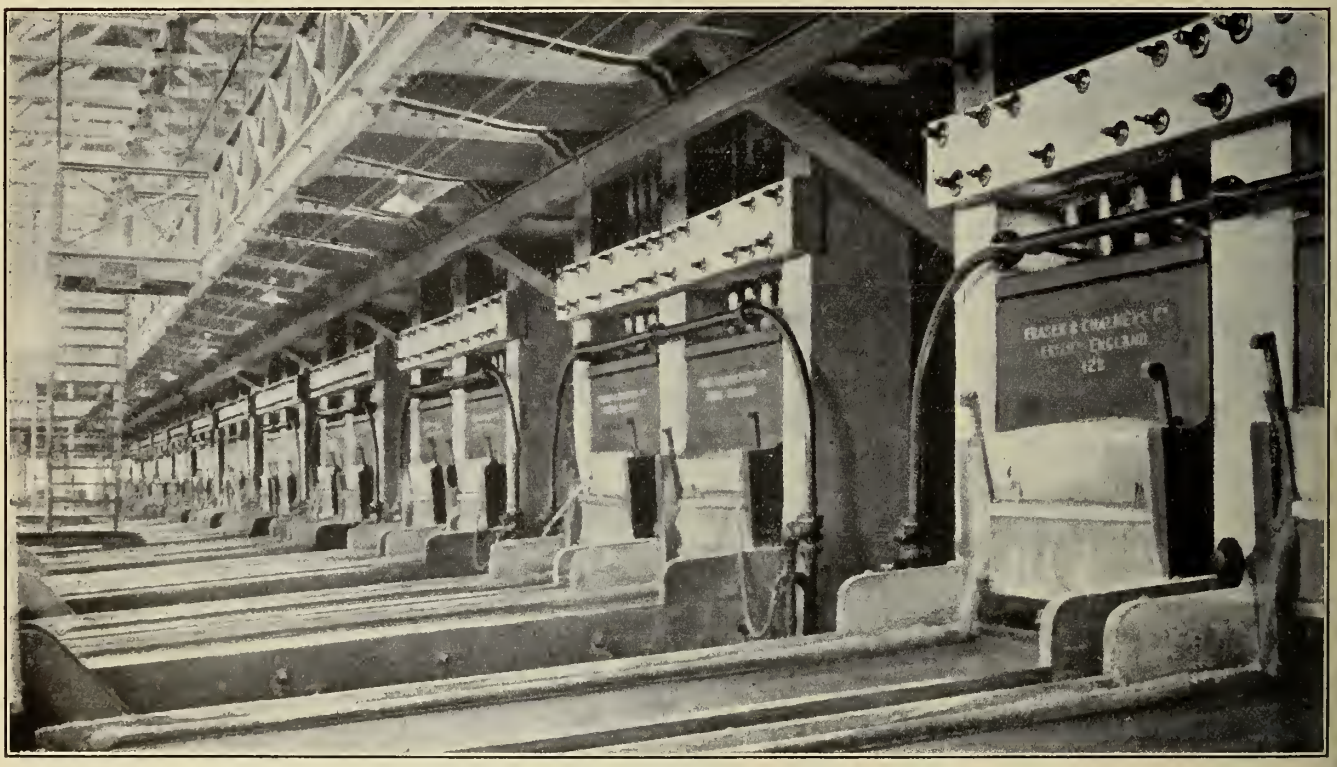

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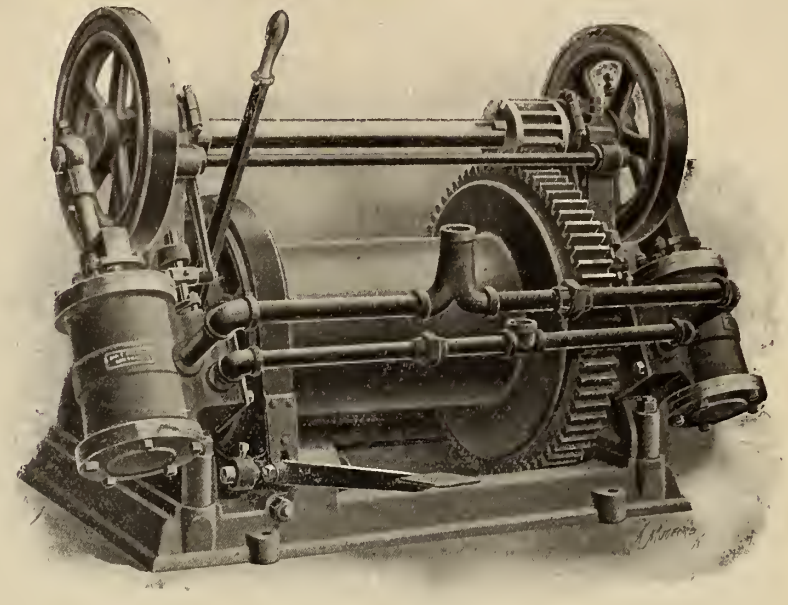

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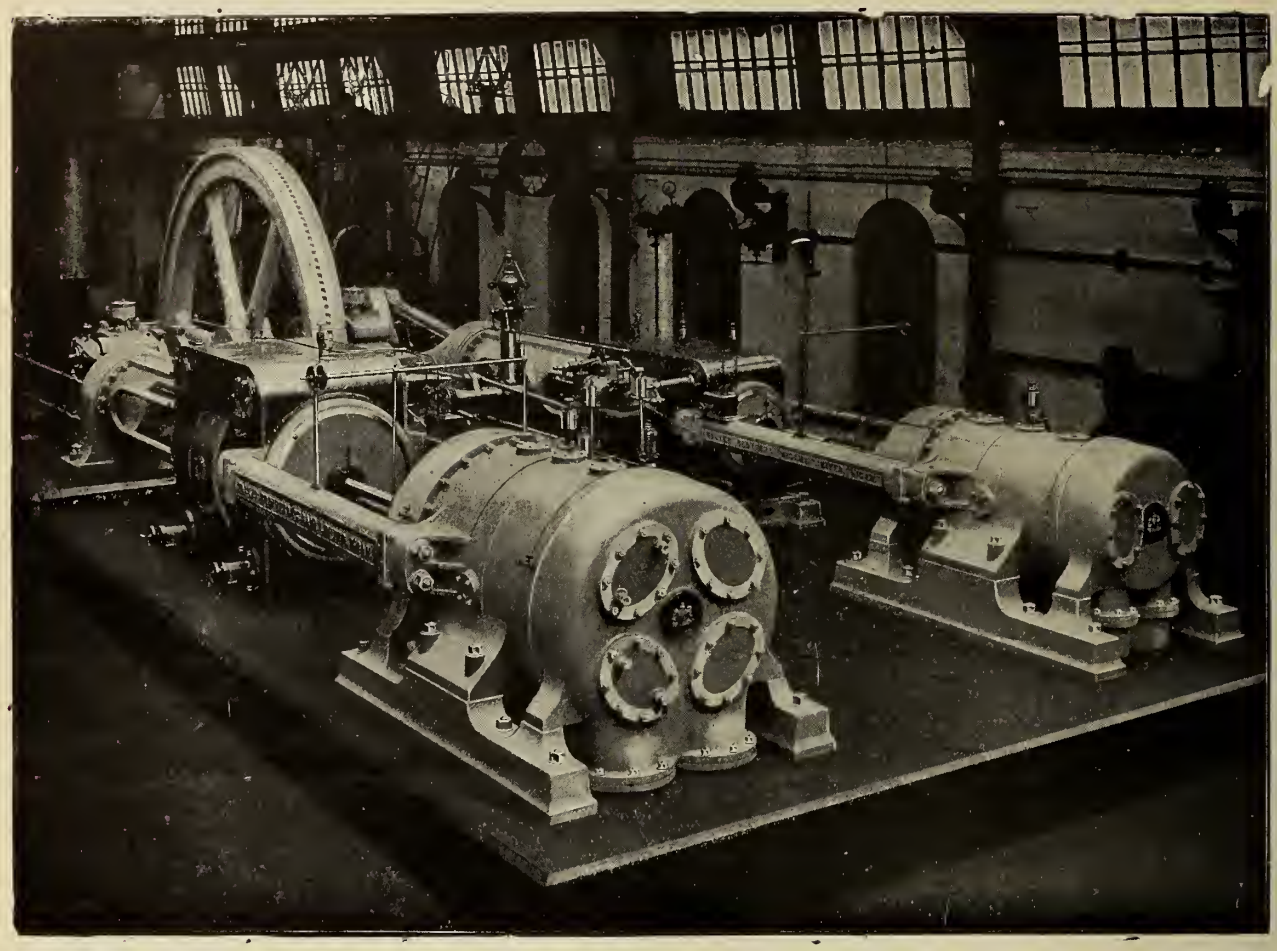

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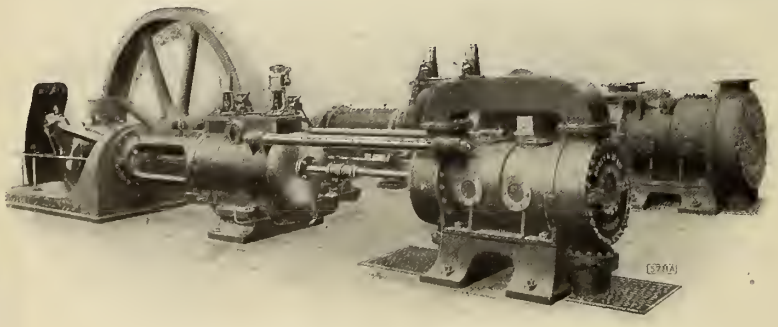

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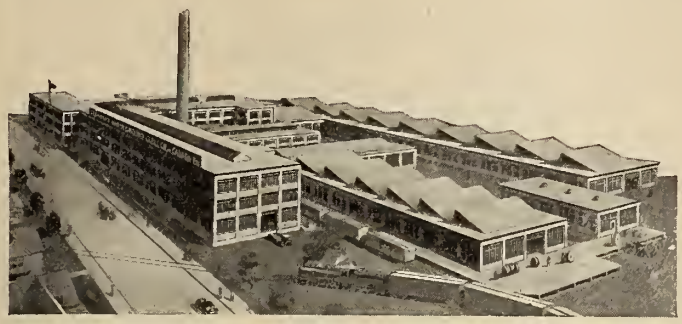

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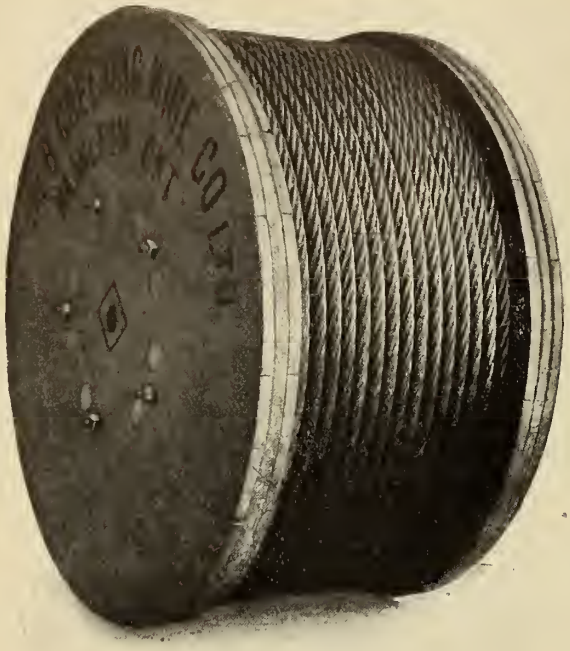

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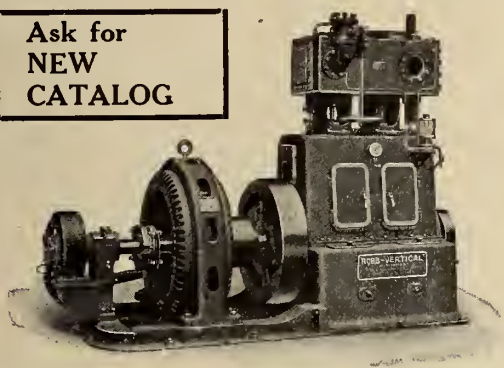

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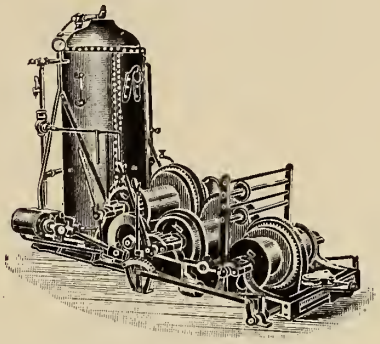

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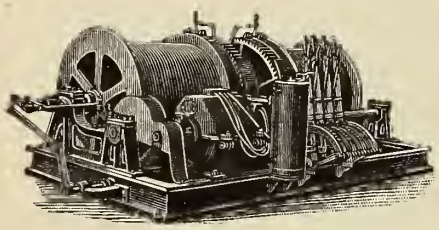

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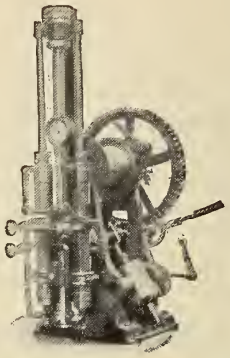

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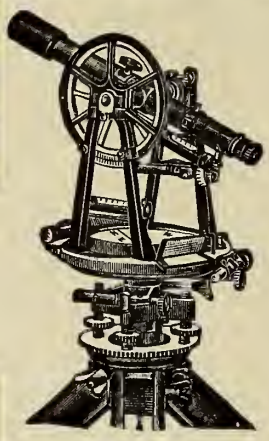

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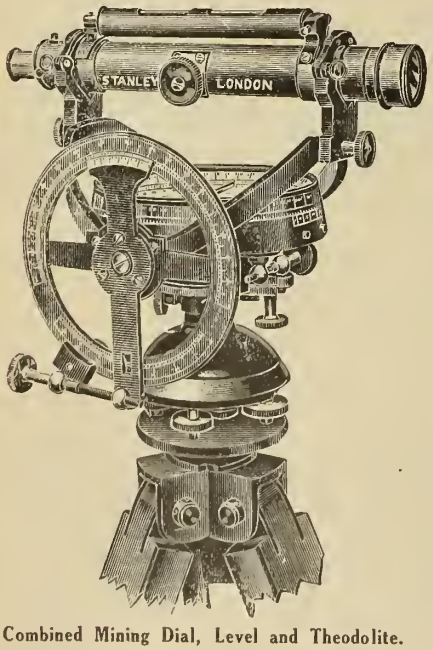

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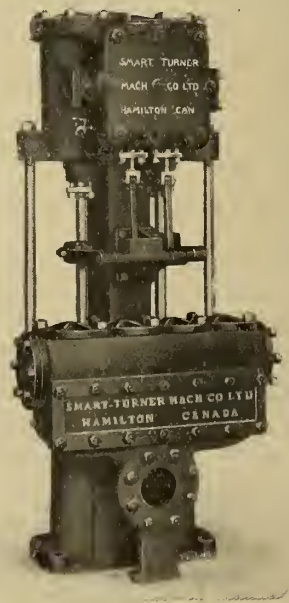

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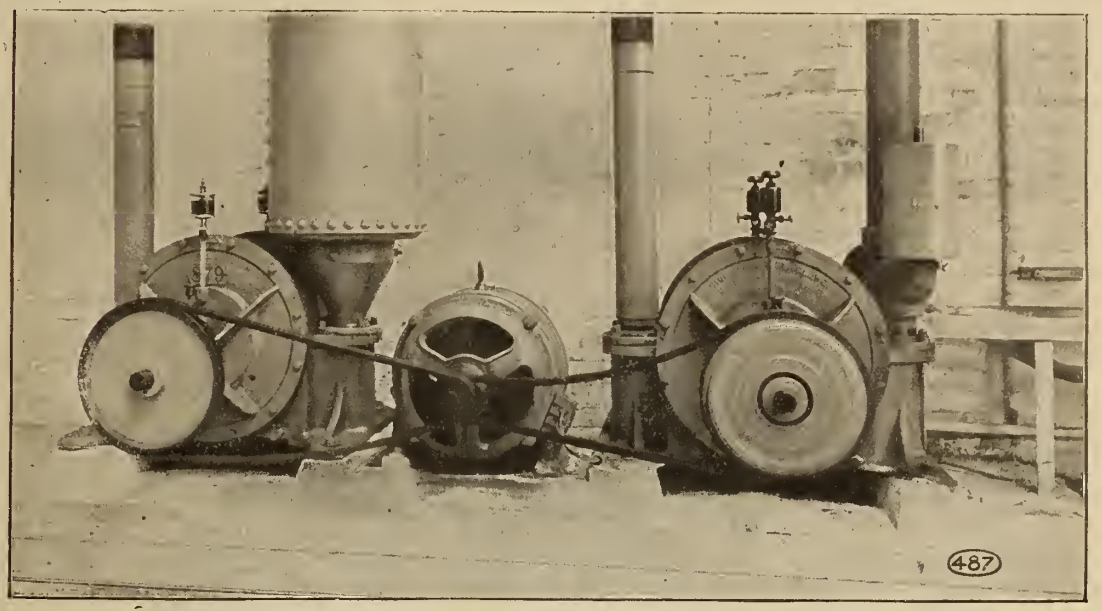

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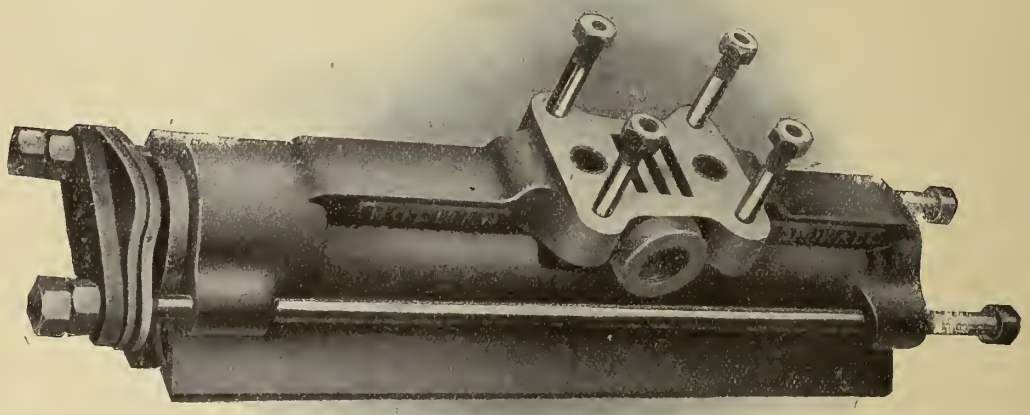

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, June 15, 1912. No. 12

The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"
Devoted to Mining, Metallurgy and Allied Industries in Canada.

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CIRCULATION.

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THE CANADIAN MINING AND EXPLORATION COMPANY, LIMITED.

The complaint of the Canadian mining man has been that the financial potentates of this country have rarely or never taken an interest in legitimate mining. The attitude of our larger bankers has been either that of scoffing indifference or of discreditable interestedness. The history of some Cobalt flotations, for instance, would hardly bear repitition. But, we are thankful to say, the order of things has changed. We have now the pleasure of seeing a definite and positive recognition of the mining industry by men who control our financial destinies.

The Canadian Mining & Exploration Company, Limited, is a privately underwritten syndicate. All the stock has been subscribed. Nothing is solicited of the public. This, in itself, is out of the ordinary. But what is more than usually a departure from modern practice is that the new concern has nothing to sell. Its stock is fully subscribed, and its financial arrangements are completed.

The nominal capitalization of the new company is $5,000,000, half of which amount is paid up. The funds thus secured are to be invested in sound securities. The interest accruing annually will amount to about $125,000. This sum is to be spent in investigating and opening mining properties. The capital is not to be touched. In fact, the capital subscribed is to be looked upon as an endowment fund. Only the income that it yields is to be used for the company's ordinary purposes.

The directorate consists of ten prominent Canadian men of affairs and ten well-known Americans. Of the ten Canadians all, with the possible exception of Sir Edmund Walker, have had direct experience in mining organizations. The American directors are also men of exceptionally high standing. The names of Corey, Converse, Rockefeller, De Lamar, Monell, Thompson, and Chadbourne are familiar to most of our readers. We have been informed that the Canadian holdings are practically eqivalent to the American. Thus, a decent balance of power is preserved.

The activities of the new organization will not be confined to mining alone. The company's charter is broad enough to cover all enterprises incidental to the development of mining, such as the utilization of water powers, the manufacture of mineral products, etc.

Mr. A. D. Miles, one of the best-known mining engineers in Ontario, is to be the company's representative in Toronto. Mr. Miles has for some years been closely identified with the International Nickel Company. The

New York representative will be Mr. William Wallace Mein, now directing mining operations at the Dome mine, Porcupine. Long experience in responsible positions in South African gold mines and in Alaska, has qualified Mr. Mein for the office of guide and advisor. To him will be referred the examination, appraisal, and development of prospects and mines.

Not only is the new company a visible token of the growing importance of mining, but it is also definite evidence of the fact that the Canadian prospector will henceforward have a satisfactory possible purchaser for his claims.

Such an organization has long been needed. The interests of the honest prospector, of the mining engineer, and of the promoter demand that they be not forced to appeal to the cupidity of the public. The power of the Canadian Mining & Exploration Company is almost unlimited. If wisely directed, and we have no reason to believe that it will be anything else, it will do much for mining in Canada.

It is pleasant to note, incidentally, that the president, Mr. Ambrose Monell, is taking no salary. While it is probable that Mr. Monell will still be able to pay for his meals, there is no doubt that his new duties will make large demands upon his time. The absence of salary indicates a wholesome sporting spirit.

The *Canadian Mining Journal* has no hesitation in extending its best wishes to the Canadian Mining & Exploration Company, Limited.

CANADA'S FIRST RESCUE CAR.

Our readers will learn form our Nova Scotian special correspondence that a rescue car has been equipped and placed in commission by the Nova Scotia Steel and Coal Company. The Dominion Coal Company was the first Canadian mining corporation to establish a rescue station. It does not, however, possess a rescue car. Thus the two large eastern companies are pioneers in this admirable work.

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OIL VERSUS COAL.

Some fear has been expressed that the recent recommendation of the Railway Commission requiring the burning of oil as fuel in place of coal on locomotives in forested sections of the Pacific slope, will, if acted on, seriously affect the coal mining industries of Alberta and British Columbia. So far as we are able to judge, however, there is no grave cause for alarm on this score. The collieries that will be affected chiefly by the change are those of the Crow's Nest Pass and of Vancouver Island. The markets, other than railway demands, are in each case expanding. This is particularly true as regards the coast, where the rapid growth of the cities has resulted in a marked increase of coal consumption both for domestic and manufacturing purposes. The difference in cost between coal and oil while unimportant in Southern British Columbia, is very considerable in the north; and on this account alone it is more than probable that the Grand Trunk Pacific, possibly the Canadian Northern, would have decided to burn oil on locomotives over the Pacific section of the lines. Thus coal delivered at Prince Rupert costs at present $7.50 a ton, whereas oil is obtainable at less than a dollar per barrel of 42 gallons. Since four barrels of oil (of 17½ Beaumé gravity) are equal for steam purposes to one ton of the best grade of steam coal, the economy in the use of oil in the instance cited is, of course, apparent.

THE WORLD'S COPPER.

According to statistics compiled by Aaron Hirch & Sohn, Canada ranked tenth in the list of copper producing countries during 1911, with 21,000 long tons to her credit. The United States produced 487,300 long tons last year, more than half of the world's total, and Japan came next with 55,000 long tons, Spain and Portugal together producing the same amount. Mexico was fourth with 54,040 long tons. Australia fifth with 44,600 tons, and Germany, Russia, Chili and Peru, sixth, seventh, eighth and ninth respectively. Japan is the only large producer whose record since 1902 with the exception of a very slight drop in 1907, has been one of uninterrupted progress. In 1902, her output was 28,600 long tons; in 1911, 55,000 long tons. The United States produced in 1911, 56 per cent. of the world's output; Japan, 6.3 per cent.; Spain and Portugal, as noted above, the same; Mexico, 6.2 per cent.; Australia, 5.1 per cent.; Germany, 3.5 per cent.; Chili, 3.4 per cent.; Peru, 3 per cent.; Russia practically the same; and Canada, 2.9 per cent. In the years 1903 and 1907, Canada's proportion was 3.3 per cent. Canada, it would seem, is hardly holding her own as a producer.

The chief European consumers of copper during 1911 were Germany, 234,985 long tons; England, 159,736 long tons; and France, 106,408 long tons. The total European consumption was 640,009 long tons. North America took 316,791 long tons; and South America about 3,000. The world's consumption was 986,300 long tons; Asia, Africa, and Australia taking only 26,500.

Figures for December 31st, 1911, show that England had 42,104 tons on hand; the United States, 39,937 tons; and France, 5,254 tons. At Rotterdam and Ham-

burg reserves to the amount of 13,400 tons were reported. These amounts, aggregating 100,695 tons, constituted the bulk of available copper on hand.

At present, visible stocks are decreasing in the United States on account of the large exports to Europe. The current prices for electroyltic and lake hover round 16.50 and 16.60, as against about 12.40 cents in June, 1911. These are most favourable symptoms. It is also significant that exceedingly few new copper enterprises are being started. This leads to the hope that over-production will not for some time be a factor in depressing the market.

DOMINION HOLIDAYS.

In comparison with the incidence of holidays in Britain and other parts of the Empire, the arrangement of the statutory holidays of the Dominion could not well be bettered. In Great Britain the people's holidays are, with one exception, relics of saint's days and holy days, and their occurrence is erratic, taking no note of the weather or the seasons. The great church feasts of Easter and Whitsuntide are notable holidays in Great Britain, but sometimes they occur at a time of the year quite unsuitable for outdoor holiday making. From Whitsuntide to Christmas there is but one holiday, namely the first Monday in every August, sometimes known as St. Lubbock's day, in memory of the scientist whose efforts created it. Canadian holidays, in comparison, are well arranged—Christmas, Victoria Day, Dominion Day, Thanksgiving Day, are all well recognized and suitable holidays. There seems to be considerable misunderstanding and ambiguity in the public mind with reference to the observance of June 3rd, the King's Birthday, and employers of labour object with justice to the observance of three holidays so close together as May 24th, June 3rd, and July 1st, at the busiest time of the whole year. Victoria Day, originally established in memory of the greatest Queen who ever sat upon the throne of the Empire, the first Queen-Empress, has become an established part of the life of Canada. It is to-day associated with Empire Day, with the imperial idea. By all means let its observance be perpetuated and strengthened, so that round it may grow all the associations so dear to the Briton, be he from the homeland or from over the seas. But the attempt to make a regular public holiday of the King's birthday is a mistake, and will result in blurring the great memories bound up with Victoria Day, and but a half-hearted observance of the King's Birthday, which in the natural course of mortal events, will some other day yield place to the natal day of another King. In Great Britain, the observance of the King's Birthday, means merely the closing of the Law Courts, the trooping of the colours, and other purely formal observances connected with the King's position as the head of the Army and Navy, and the embodiment of the supreme power of the realm. It would be a thousand pities to disturb the present most admirable arrangement of Canadian holidays—May 24th, the feast of our Imperial associations, July 1st, the natal feast of our national entity, and Thanksgiving Day, the very name of which signifies its own intent.

THE PROSPECTOR AND THE MINING LAW.

This is to be no dissertation upon a threadbare subject. Our intention is only to give expression to our wrathful surprise at an article published in The Mining and Scientific Press, May 18. Phenomenally misinformed as is the writer, Mr. T. F. F. Van Wagenen, it is still more a matter of astonishment that our admirable contemporary should give tacit assent to his statements.

In pleading for the retention of the outworn apex law, with its mischievous extralateral rights, Mr. Van Wagenen is responsible for the following: "In the Western United States and in Alaska, where the American law applies, there are thousands of prospectors in the field continuously. . . . But when the international boundaries are reached in either direction, where the American law gives place to that of Mexican or Canadian, they stop, as if at a dead line." After asserting that in five years he met not one prospector in Mexico, the writer continues. "British America may be searched from Labrador to the Pacific with little better results. There was a time when the province of British Columbia had an apex law, and while it was in force the rugged region hummed with explorers. When it was repealed they faded away like snow before a chinook."

Just how large a sprinkling of explorers and prospectors it takes to create a hum in a rugged region it is not for us to say. But to anyone who has even a superficial acquaintance with Canadian mining affairs it is apparent, beyond argument, that prospecting was never so vigorously carried on as at the present time. Northern Ontario is being traversed by the pioneer pospector as never before. Witness, for instance, the recent rush to Whisky Lake. Witness also widening circles of territory being examined in the regions centering in Porcupine and Larder Lake. And, as clearly controverting Mr. Van Wagenen's sweeping statements, consider the fact that some nine or ten parties have this spring started for Hudson Bay and one for Baffin's Land. The northern and eastern portions of Quebec are being more actively prospected than at any other time in our history. Prospecting parties in search of coal are numerous in Northern Alberta. In British Columbia, although there is no rush, the search for mineral deposits goes on merrily.

The prospector may have stopped humming, but he is still with us. In fact, prospecting is one of the salient

features of life in Canada. How Mr. Van Wagenen could arrive at his conclusions baffles our comprehension. He has evidently been carried away by his own desire to prove his case and has missed the whole philosophy of mining rushes. It would be interesting, by the way, for Mr. Van Wagenen to enquire of British Columbia prospectors whether they do or do not wish the apex law put in force in that province. He might at the same time take occassion to get a little first-hand information of this not insiderable, but much misunderstood, Canada. Meanwhile, by all that is right and desirable, we adjure Mr. T. F. Van Wagenen to leave us alone.

EDITORIAL NOTES.

An editorial ambiguity in our issue of June 1st gives the impression that the International Geological Congress is to meet in Toronto in August of this year. This is, of course, not the case. August, 1913, is the month of meeting.

From the Pan-American Union headquarters at Washington we have received a copy of the mining laws of the Republic of Colombia. The translation is credited to Mr. Phanon J. Eder, a New York barrister. This translation is the first done in twenty years. We notice that the prospector is given a very free hand, and that in the main the laws are liberal.

More good Canadian money going to Mexico. A Canadian syndicate ,of which Mr. W. D. Ross, general manager of the Metropolitan Bank, and Mr. Strachan Johnson are members, is reported to have arranged for the purchase of two gold mines in Northern Mexico. The mines in question are the San Patricio and the Santa Ana y Anexas, both in the State of Parral.

The annual report of the Tilt Cove Copper Company, a British undertaking operating in Newfoundland, has just been issued. The gross profit during 1911 is shown to have been £23,381 13s. 3d., and the net profit £15,072 0s. 2d. Half of this amount is retained by the Cape Copper Company working the mines under agreement. The Tilt Cove Copper Company paid an interim dividend of sixpence a share last December, and a final dividend of 9d. per share is now to be distributed. The total distribution to shareholders during the year is thus equal to 3½ per cent., which can only be regarded as a very moderate return on the year's operations.

A gold mining district in British Columbia that has never been given a fair opportunity is that of Bridge River. It is true that for a time prospecting in this field was reasonably active, and much territory was "blanketed"; but in no instance was development systematically and persistently undertaken. There was reason enough for this, in that the quartz veins or masses, although frequently large, carried low value, probably not averaging $5.00 a ton, and there was no inexpensive way of taking in supplies or machinery. It is likely, however, that railway extensions will make the Bridge River readily accessible in the near future, in which event some of the quartz veins in the district would be well worth further attention.

The Audit Act permits the Government to remit duties when such action is deemed to be in the public interest. In consequence of representations from contractors and others in the West that Canadian cement manufacturers were unable to supply present urgent market requirements. The Hon. the Minister of Finance, to relieve the situation, has provided for the remission of half the duties for a prescribed period. It is questioned in some quarters whether this provision will be particularly effective; but, in any case, the situation is not likely to continue. Cement is now being consigned to the West in large quantities and it will not be long before the conditions will be again normal. Meanwhile there is no better indication of the rapid industrial development taking place in Western Canada than the increased demand for cement, the consumption of which has more than doubled in four years.

The discovery has been made in Ottawa that the present system of collecting and publishing Canadian trade statistics is not as perfect as it might be. In other words, it is as bad as it could be. Since there has been no attempt at co-operation between the Dominion and Provincial authorities, and since in each case the method of compiling and presenting such returns is different, the enquirer endeavouring to reconcile the apparently divergent results, either is driven to desperation, or recognizes in time the hopelessness of the task. It is announced that the Trade and Commerce Department has appointed a Commission, with a view to correcting this needlessly foolish state of affairs. The Provinces are to be asked to co-operate and doubtless will do so. The opportunity is favourable to bring about a much needed reform to provide for uniformity of methods and results in respect of mining statistics, and we would direct the attention of the Federal Department of Mines to the desirability of following the example of the Trade and Commerce Department in inviting the Provinces' co-operation towards the attainment of this purpose. Now, moreover, that the annual mineral production of the Dominion exceeds a valuation of a hundred million dollars, it is surely time that provision were made for the publication of statistical returns at more frequent intervals. With the co-operation of the Provinces (which, however, is essential), the Federal Department should experience no difficulty in issuing quarterly returns. Such action would be of real advantage to the industry.

PERSONAL AND GENERAL

Mr. J. McEvoy left Toronto on May 30 for Alberta and British Columbia, where he will be engaged during the summer in professional work.

Mr. W. E. H. Carter, of the firm of Carter & Smith, has returned to Toronto from a visit to the Montreal River and Gowganda mining divisions, where he examined several properties.

Mr. A. B. Willmott, consulting mining engineer, Lumsden Building, Toronto, who is operating at Killarney, Ont., spent several days in Toronto in the first week of June.

Mr. Fred Connell, mining engineer, Royal Bank Building, Toronto, has returned from a visit to the Thunder Bay silver district.

Mr. Eugene Coste's permanent address is now 128 Seventh Street, Calgary, Alberta.

Mr. R. T. Bayliss, managing director of the British South African Company's Mines Development Company, and chairman of El Oro Mining Company, Mexico, is returning to England after a protracted journey in Rhodesia and the Congo.

Mr. H. G. Young, formerly manager of the Hudson Bay Mines, Ltd., has settled in Toronto. His address is 13 Russell Street.

Mr. William Frecheville, A.R.S.M., F.G.S., past-president of the Institution of Mining and Metallurgy, has been appointed Professor of Mining at the Royal School of Mines, London, England. Mr. Frecheville was born in Dartmouth, Nova Scotia. In the course of a most successful career he has visited nearly every important mining region in the world. For some years he has been a director of the Anglo-French Exploration Company. It may be mentioned that Mr. W. A. Carlyle, present Professor of Metallurgy in the same institution, was also born in Canada. Mr. Carlyle, it will be remembered, graduated from McGill in 1891, in 1895 organized the B. C. Development Mines, in 1898 became manager of Le Roi, in 1899 took over the management of the Rio Tinto, Spain, and in 1907 accepted his present position. Both gentlemen are well known in Canada.

Hon. Richard McBride, Premier and Minister of Mines for British Columbia, has returned to that province from a visit to England.

Mr. Wm. Graham McMynn, for years gold commissioner at Greenwood, Boundary district of British Columbia, has been transferred to Golden, Northeast Kootenay.

Mr. I. P. Merrill, president of the Hedley Gold Mining Company, lately paid one of his periodical visits to the company's mine and 40-stamp mill in Camp Hedley. B.C.

Mr. F. C. Greene, general manager of the Graham Island (B.C.) Coal and Timber Syndicate, Ltd., was in Seattle, Washington, from Queen Charlotte Islands, last month.

Mr. Howard W. Dubois, of Philadelphia, managing director of the Quesnelle Hydraulic Gold Mining Company, late in May left Vancouver, B.C., for Prince Rupert and Hazelton, intending to go thence along the Grand Trunk Pacific Railway route to Fort George, and from there south to his company's hydraulic mine in Quesnel mining division, Cariboo district.

Mr. J. M. Ruffner, of Cincinnati, manager of the North Columbia Gold Mining Company, returned to Atlin, B.C., a short time ago, and has since commenced the season's hydraulicking operations on Pine Creek, Atlin, in which mining division his company has for years been placer mining extensively and with considerable success.

Mr. Charles Camsell, of the Geological Survey of Canada, went from Ottawa to British Columbia last month. In common with those of other members of the Survey field geological staff, Mr. Camsell's duties this year include making preparations to supply information to the International Geological Congress, that is to meet in Toronto next year, and afterwards to visit various parts of the Dominion.

Mr. R. G. McConnell, one of the senior geologists of the Geological Survey of Canada, who last year did field work in Portland Canal and Observatory. Inlet districts, British Columbia, is expected to this season investigate the geology of the Rainy Hollow district, in the northwestern part of Atlin mining division, B.C., where deposits of copper-silver ore are being opened preparatory to production.

Mons. Perrier de l'Abathie, of Paris, France, whom the Nelson Daily News has announced as managing director of the company operating the Blue Bell lead mine, on Kootenay Lake, British Columbia, has been visiting that property, which is again being worked under the direction of Mr. S. S. Fowler, the company's general manager. The Blue Bell is the oldest mine in British Columbia, its outcrop of lead ore having been discovered in 1825 by David Douglas, a Scottish botanist, who was investigating the flora of the Kootenay country. In connection with the mine there is a 200-ton concentrating mill, which was erected and equipped several years ago.

Mr. J. Dix Fraser, general manager of the Atikokan Iron Company, Port Arthur, Ont., has returned from a visit to Europe.

Mr. Lewis Stockett, formerly in charge of the Hosmer Collieries, B.C., is now acting as general superintendent of the Coal Mining Branch, Department of Natural Resources of the Canadian Pacific Railway, with headquarters at Calgary.

Mr. A. J. Beaudette, mining engineer of the Grand Trunk Pacific Railway, was in Montreal last week to confer with Mr. Chamberlain, who recently succeeded Mr. Hayes in the presidency of the Grand Trunk systems. Mr. Beaudette expects to spend the summer months in British Columbia.

It is satisfactory to learn that Mr. Eugene Coste, president and managing director of the Canadian Western Natural Gas, Light, Heat & Power Company, of Calgary, who suffered from ill-health in the spring, is now practically recovered.

Dr. W. A. Parks, of Toronto University, Toronto, has gone to St. John's, Que., to study and report on the building and ornamental stones in the surrounding districts. Dr. Parks has been retained by the Mines Department of the Dominion to prepare a monograph of the subject of the building and ornamental stones of Canada and has already completed his investigations of these resources in Ontario, in portions of Quebec and the Maritime Provinces.

Mr. Howland Bancroft, well known to many of our readers in the West, has resigned from the United States Geological Survey in order to engage in private practice as a consulting mining geologist. His present address is Suite 730 Symes Building, Denver, Colorado. Mr. Bancroft is a member of the Canadian Mining In-

stitute and has attended several of the meetings of the Western Branch.

Mr. Leland D. Adams, manager of the East Canada Smelting Company's McDonald mine at Weedon, Que., has returned from a business visit to the United States. The company is now installing a new power plant, a tramway and a sampling mill.

Mr. John E. Hardman has returned to Montreal from a visit to the lead mine on Calumet Island, Que.

Dr. J. Bonsall Porter, of McGill University, Montreal, sailed for England on June 13th by the S. S. Corsica. Dr. Peterson, the principal and Dr. Porter will represent McGill University at the Universities Congress, the first meeting of which will be held in Edinborough on July 1st.

Lt.-Col. J. J. Penhale (liquidator of the Ling Asbestos Co.), of Sherbrooke, Que., is in command of the Seventh Brigade of the Sherbrooke unit, which has been ordered to Petewawa for the annual summer military training.

Prof. E. Dulieux, of L'Ecole Polytechnique, Montreal, has returned from a visit to Gowganda and Porcupine, and leaves on June 15th to continue his investigations of the iron deposits of Quebec for the Provincial Government.

Mr. J. Read, superintendent, and Mr. Fritz Cirkel, consulting engineer, of the Champs d'Or Rigaud Vaudreuil, engaged in hydraulic mining in Beauce County, Quebec, have resigned.

Mr. H. P. Gordon, an experienced Californian hydraulic engineer, has been appointed superintendent of the Champs d'Or mines in the Seigniory Rigaud Vaudreuil, Beauce County, Quebec.

Mr. Charles Fergie left on June 13th on a visit of inspection of the Pacific Pass, Western Coal, and Lethbridge collieries, of which he is consulting engineer.

Mr. A. G. Bridger, of the Drummond Mines, Ltd., Cobalt, intends spending the summer in Europe. His address for the next few months will be 7 Hathaway Road, Croydon, Surrey, England.

THE UNIVERSITY OF TORONTO AND THE MINERAL INDUSTRY

By H. E. T. Haultain.*

Part I.

The Province of Upper Canada was founded under the Constitutional Act of 1791. During the preceding seven or eight years a United Empire Loyalist population had been settling on the banks of the St. Lawrence, on the shores of the Bay of Quinte, in the Niagara Peninsula and on the shores of Lake Erie, and the population of the Province at this time numbered about sixty-five thousand.

Seven years later, in 1798, a committee of the Executive Council, of the judges, and of the law officers of the Crown, recommended that five hundred thousand acres of land should be devoted to educational purposes, of which one-half should be reserved for the University, and that the University should be located at York.

In 1826 the Rev. John Strachan, M.A., Archdeacon of York, was commissioned to visit England and returned with a royal charter founding a university. The charter was dated the 15th of March, 1827, and, on the 3rd of January, 1828, the new lands for endowment already selected were conveyed by letters patent to the Corporation of King's College thus created. Shortly afterwards, the Council of the College purchased at one hundred dollars per acre, one hundred and sixty-eight acres of beautiful park lands, on which have subsequently been built both the Parliament and University buildings.

King's College was opened in 1843 with these seven professorships: (1) Classical Literature, Belles-lettres and Logic; (2) Divinity, Metaphysics and Ethics; (3) Experimental Philosophy and Chemistry; (4) Mathematics and Natural Philosophy; (5) Anatomy and Physiology; (6) Law; (7) Surgery. The salaries of the professors in Classics and Divinity were £500, and of the other Arts professors, £450.

A statute of 1844 provided for the establishment, as soon as funds should be available, of chairs in (1) Hebrew and Oriental Languages; (2) Political Economy; (3) Medical Jurisprudence; (4) Music; (5) History, Geography and Antiquities; (6) Geology and Mineralogy; (7) Civil Engineering; (8) Architecture; (9) Painting; (10) Agriculture.

Little progress, however, was made in these appointments for want of sufficient funds, and much trouble seems to have been caused by disputes over religious matters. The Anglicans, Methodists and Presbyterians were active fighters. We are told that Bishop Strachan and his friends attacked the University as a "godless institution."

In 1850 King's College became the University of Toronto and again a special committee recommended the appointment of professors in Civil Engineering and in Geology, as well as in Agriculture and other subjects.

In 1853 the chairs of Natural Philosophy and Natural History were founded and John Tyndall was an unsuccessful applicant for the first and Thomas Huxley for the second.

In 1856 Professor E. J. Chapman was appointed Professor of Mineralogy and Geology, a position he held for forty-two years, retiring in 1898.

In 1858 the crowning stone of the beautiful Main Building was laid by the Governor, Sir Edmund Walker Head. The original plans for this building were curtailed for want of money, and, notwithstanding, the cost considerably exceeded the appropriation. This seeming extravagance in building was, as most friends of the institution now think, justified by the result. The Hon. Edward Blake, addressing, as Chancellor, the annual convocation in 1884, said, "We sometimes hear murmurs as to the wisdom of their erection, but those who know as I do—though I was but a young man at the time—all the circumstances of the University when that policy was adopted, know that these buildings were in a marked sense the sheet anchor of the institution in the storms which at one time threatened to subvert it." The new buildings were opened for academic purposes in 1859, and from this point dates an era of greater prosperity for the University; but it

*Professor of Mining Engineering in the University of Toronto.

was not until nearly twenty-years later that a further step was made towards the benefit of the mineral industry. The statute of 1844 provided for the establishment of a chair in Civil Engineering, but it was thirty-four years before this was carried out.*

In the Session of 1877 the Legislative Assembly, by Resolution, sanctioned the proposals for the permanent establishment of the School of Practical Science of the Province of Ontario. These proposals were in effect that the Government should utilize the teaching power of University College, which already existed for the like objects in four departments, and could be made applicable to the wants of this Science School; and in addition thereto should appoint a Professor of Engineering and such assistants in the several departments as might be required in supplementing the work of the College Professors.

†"The position which it is intended the School of Practical Science shall satisfactorily occupy in the Educational System may be indicated as follows:—

Firstly.—Students who have passed through the regular courses of the School will be enabled to prosecute professionally, (1) Engineering; (2) Assaying and Mining Geology; or (3) Analytical and Applied Chemistry.

With this view the Diploma admitting to the standing of "Associate of the School" will be granted in each of these branches after due examination.

In Engineering it is intended that the instruction shall afford a thoroughly scientific basis for operations in the field. In the absence of a machine shop and of facilities for visits to mines during session, visits to workshops and excursions during the long vacation will be taken advantage of. The establishment of a Diploma for special qualifications in Assaying and Mining Geology, apart from the knowledge of these subjects incidental to the course in Mining Engineering is sufficiently called for by the necessity which exists for the development of the mineral wealth of the Province. Students who pass through the course necessary to obtain this diploma will have acquired the knowledge requisite for inspecting and surveying mineral lands, as well as the ability to report accurately on the composition and value of economic minerals generally.

The importance of the study of Chemistry is now fully recognized, and in Canada, through the Public Analists and otherwise, protection is being secured to consumers, while the producers are necessarily brought to recognize its importance. The course in Chemistry will be such as to fit the student for the position of Public Analyst or of Consulting or Resident Chemist.

Secondly.—It is proposed to furnish preliminary scientific training for students entering the professions of Surveying and Medicine. The certificate to be granted in Surveying will be attainable by one year's study, and it is intended that this should entitle its possessor to appear one year earlier for his examination as Provincial Land Surveyor."

The School so constituted was opened on October 1st, 1878, with the following staff:—

H. H. Croft, D.C.L., Professor of Chemistry and Chairman of the Board.

The Main Building, University of Toronto

E. J. Chapman, Ph.D., LLD, Professor of Mineralogy and Geology

James Loudon, M.A., Professor of Mathematics and Natural Philosophy.

R. Ramsay Wright, M.A., Professor of Biology and Secretary of the Board.

J. Galbraith, M.A., Professor of Engineering.

W. H. Ellis, M.A., M.B., Assistant to the Professor of Chemistry.

The first four were professors in University College.

It will be seen from this that from the very start the "School," as it was then known, was prepared to do much for the mineral industry. Not only was Engineering to include Mining Engineering, but there was a special course in Assaying and Mining Geology with a diploma attached equal in dignity to the diploma in Engineering. The Professor of Mineralogy and Geology was a remarkable and interesting man, a skilful fencer and a poet, as well as a scholar and teacher. He was educated mainly in France and partly in Germany, enlisted in the French Army, and served an actual campaign in Algiers. He was also Professor of Mineralogy

*Most of this has been taken from "The University of Toronto and its Colleges, 1827-1906."—Edited by W. J. Alexander, Published by the Librarian, 1906.
†From the Prospectus of the School of Practical Science of the Province of Ontario, First Session, 1878-1879.

The Chemical and Mining Building

Main Engineering Building, The Old S.P.S.

in University College, London, before coming to Toronto. He was a voluminous writer on Canadian Geology, on Assaying, and on Blowpipe Analysis. This course in Assaying and Mining Geology remained in force until the session of 1892-93, when it was replaced by the department of Mining Engineering; but I can find no record of any student having earned a diploma in this course.

The course in Analytical and Applied Chemistry appeared to be unpopular, as the records show that no diploma was issued in this course until 1890, by which time seventy-nine diplomas had been granted in the course in Engineering.

This course in Engineering would appear to be the most remarkable development in the history of the University, remarkable alike in the rapidity of its growth and in the consistency of its development. The central figure, in fact an isolated figure, in this development, is that of the Professor of Engineering, afterwards Principal of the School and later when it was absorbed into the University, Dean of the Faculty of Applied Science and Engineering. It is probable that no other large department of any University in Canada has grown with such rapidity, nor has any other department of the University of Toronto with a live activity, departed less from the general direction laid down for its growth in its early stages. That the growth is so strong and so persistent is evidence of the closeness of the course to the needs of the country. This general engineering course is the backbone of the work that the University is doing for the mineral industry and will continue to be so.

John Galbraith graduated in Arts in the University of Toronto in 1868, winning, in his course, the Prince of Wales' Prize for General Proficiency, and the Gold Medal in Mathematics, besides other prizes. The following years were spent in a variety of engineering work in both the mechanical and civil branches.

He was appointed Professor of Engineering in 1878. For the first few years of the School's existence he did all the Engineering teaching, including drawing and surveying.

W. H. Ellis, M.A., M.B., who had been associated with the School from the start, was appointed Professor of Applied Chemistry in 1882. In 1889 L. B. Stewart, Ph.S., D.T.S., joined the staff as Lecturer in Surveying and the following year two of the School's own graduates returned, C. H. C. Wright as Lecturer in Architecture, and T. R. Rosebrugh as Demonstrator in the Engineering Laboratory.

In this year the School was affiliated to the University, the Professor of Engineering was appointed Principal and the management of the School was transferred to a Council, consisting of the teaching faculty of the School and not including the Arts professors who continued, nevertheless, to give instruction in their respective subjects to the School students. From this time on there was a steady growth in the staff until the present. There are now twenty-eight professors, associate professors and lecturers in the Faculty of Applied Science alone, besides a large number of demonstrators and fellows. This is in addition to the Arts professors in Mathematics and several other subjects who still teach the Engineering students.

The first prospectus of the School does not contain the name of the Professor of Engineering; he was appointed after its issue, but in time for the first session. The first syllabus of the course in Engineering is very different from the one drawn up after his appointment. The syllabus of the second prospectus remains to the present the main framework of the department of Civil Engineering. It has grown, it grew continuously, it has been elaborated and to some extent modified, but the main lines have remained. The course to-day rsembles the course of 1880 as the mature oak does the sapling. The latest change in the course, by some considered a radical departure, the addition of four lecture courses on business and finance is simply the blossoming of a bud that was shown to me many years ago and was probably a suppressed feature of a much earlier stage.

The main features of the course are, a groundwork of pure mathematics, a broad training in principles, followed by illustrations of the applications of the principles. The practice of Engineering is left to be learnt in the field. The exception to this is in surveying and draughting and chemistry, where the student is given sufficient of the practice to make him a useful man in these subjects immediately on graduating. Engineering is so wide and the time of the academic period so limited that very much that would be desired must be left out of the course. Everything has been made subservient to the idea of the application of principles. Mathematics is for the preparatory mental training. The heavy course in principles keeps their application always in view. To this is added facts, methods and processes sufficient for the course in the application of principles. As the time is so short only the application of main principles can be illustrated. The whole is designed to enable and cause the boy to go on after graduation with the training which has only been commenced in the University. "We do not make Engineers" has been the oft re-iterated statement for thirty years of the Professor of Engineering; "We prepare them to become Engineers."

Laboratories have been added, but not workshops, laboratories for the illustration and examination of principles. Only draughting, surveying, assaying and chemical analysis have their equivalent of shop work, but in each of these the elucidation of principles takes precedence over the practice. There has been a splendid and careful development of laboratories in every direction, of which the accompanying photos will convey some idea.

The duration of the course was three years and in each year there were twenty-five weeks of actual teaching time, the summers were to be spent at work in the field. Examinations were held at the end of each session and the diploma of the School was granted on the satisfactory completion of the course.

After a graduate had spent three years in the actual practice of his profession, two years of which must have been on the construction and operation of engineering works as distinct from surveys merely, he could become a candidate for the degree of C.E. of the University, which was granted after the candidate submitted a satisfactory essay with drawings and estimates. This regulation was afterwards enlarged to include the degrees of M.E. (Mechanical Engineer), M. E. (Mining Engineer), and E.E. (Electrical Engineer). These degrees have not been popular with the graduates, the trouble being that anybody can put these letters after his name, with the result that it is generally the imposter who does so. But the intention of the University is well worthy of notice.

A degree that called for three years of actual work in the field is something very unusual and it is a great pity that circumstances should have belittled the use of these letters.

In 1892 an optional fourth year was added to the three years' course, and on the satisfactory completion of this year the degree of Bachelor of Applied Science (B.A. Sc.) was granted to the candidate by the University.

Dean Galbraith

Some of the regulations governing the granting of this degree were as follows:

3. Each candidate shall prepare a thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University Examiners. This thesis is to be accompanied by all necessary drawings, specifications, tables and estimates.

4. Candidates will be required to select two subdivisions in any one of the following groups, and to pass such written and oral examinations on the subjects selected as may be prescribed by the University examiners.

A.—Astronomy.
Geodesy and Metrology.
B.—Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.
C.—Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.
D.—Mineralogy and Geology.
Metallurgy and Assaying.

As the laboratories in all departments have grown the work of this fourth year became largely laboratory work. The students had the opportunity to specialize along their own lines and it was a very satisfactory arrangement.

The three year course for the diploma has now been done away with and students commencing during the past three years have entered on a four-year course leading to the degree of B.A. Sc. This has permitted a re-arrangement of the curriculum and somewhat reduced the freedom of the fourth-year. This was necessary as the work of the first three years had become much overcrowded.

It is hoped that before long an optional fifth year leading to a higher degree will be added.

In 1880 the diploma of the School was granted in "Engineering" and the studies could be pursued along three optional lines, Civil, Mechanical and Mining. In the session of 1890-91 this was sub-divided into (1) Civil Engineering (including Mining Engineering), and (2) Mechanical Engineering (including Electrical Engineering). The following year Architecture was added. In 1892-93 Mining Engineering became a separate course and Civil Engineering "included" Sanitary Engineering.

At the present time the separate courses stand as follows:—

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.
6. Chemical Engineering.
7. Electrical Engineering.
8. Metallurgical Engineering.

In 1880 the fees for the course paid by the student amounted to $160. This has been raised from time to time until it now amounts to $450. The standard of scholarship required for entrance has also been steadily raised. Despite these facts the growth in attendance has been rapid and steady.

The Government Blue-book covering the work of the University for the year ending 30th June, 1911, shows 779 students in the Faculty of Applied Science and Engineering, of whom 99 were in the department of Mining Engineering.

The distribution of the students in the different subdivisions of the University was as follows:

University College—Arts	1086
Victoria College—Arts	516
Trinity College—Arts	140
St. Michael's College—Arts	46
Medicine	567
Applied Science and Engineering	779
Household Science	101

Education	262
Forestry	46
University of Toronto—Candidates for Ph.D., M.A., Dentals, Vets., etc	576
Total	4112

Of this large number 1,018 were women and 3,094 were men. As there were 311 women students in University College there were more men students in the Faculty of Applied Science and Engineering than in any other subdivision of the University, though the combined group of Arts students in the various colleges would, of course, outnumber them.

same time, ceasing to develop its agriculture. The Agricultural College at Guelph is a splendid evidence of the good hope that lies before our farming population. For the other side of our life we also need leaders—in opening up new country by railways, in constructing large works, in developing mines. For producing men who will direct these activities there is the Faculty of Applied Science, formerly known as the School of Practical Science.

"A distinction must be kept clearly in mind. The aim of the Faculty of Applied Science is not to be confounded, as is sometimes done, with the work of technical education. The latter consists on the one hand of

The Thermo-Dynamics Building

President Falconer in an article contributed to the "University Monthly" in 1909, said: "Unless all omens fail the Faculty of Applied Science will soon become the second in size in the University and may creep up upon the Faculty of Arts though Arts has such a lead that it will probably hold the first place for many years. During the last two years, not including the present, the ratio of increase in the Faculty of Applied Science has been thirty-two per cent., a larger proportionate increase than in any other Faculty.

"This Faculty has developed healthfully and in conformity with the demands of the country. Ontario has become a great manufacturing province without, at the

giving artisans and the youth in school instruction in the scientific principles that underlie the various trades in which they may be engaged, and on the other hand of instruction in the principles and technique of the actual trades. Technical education is meant for the man who whether as foreman or skilled workman is engaged in some trade.

* * * * * * *

"In the Faculty of Applied Science, however, students are being trained, who will become the directors of the works in which the technically trained men will be employed."

(To be continued.)

THE MURRAY LABORATORY OF MINING ENGINEERING, HALIFAX, NOVA SCOTIA

By F. H. Sexton.*

The most important construction work in connection with the Technical College during the past year, has been the building and equipping of the Murray Laboratory of Mining Engineering and Metallurgy, for the use of the mining engineering students of the college. It has been planned with the view of testing, in commercial quantities, any of the ores or coals of the province, with a view of establishing successful commercial treatments of the same.

The laboratory is situated in the rear of the main college building on Spring Garden Road and is constructed of concrete, plain brick, with steel frame and steel roof trusses.

The building is of simple classic design, in full keeping with the main college building. What timber has been used in the construction is of heavy design, thus making the whole building a good example of modern slow burning construction.

Most of the work in connection with the design and equipment has been carried out by the staff and students of the mining engineering department of the college. The steel roof truses were designed by students of the civil engineering department. Mr. W. M. Brown designed the architectural details and has acted as consulting architect during the erection of the building. Prof. E. A. Holbrook of the college staff has had charge of the inspection of the building during erection on behalf of the Government. F. A. Ronnan & Co., of Halifax, were the general contractors.

At the time of writing, the walls and covering of the building are practically completed, most of the machinery in the laboratories is here or has been ordered, and early spring will probably see the whole in active use.

General Description of the Building.

The general dimensions of the building are 87 feet, east and west, and 89 feet 6 inches north and south, being almost square, with no projections or ells. The main part of the building is one storey high, approaching modern factory construction. The north half of the building is of two storeys and will be finished and divided into various rooms as needed in the work. Owing to the slope of the ground on which the building was erected, it was possible to have the floor in the north half of the building, 9 feet 6 inches higher than the floor in the south half. This will prove of great advantage in the handling of materials and in allowing the heavy crushing machinery to be placed close to the floor line, rather than high in the air, as unfortunately is the case in many college metallurgical laboratories. This difference in elevation also allows the passage of the coal or ore from one machine to another by gravity alone without the necessity of rehandling the material.

Rooms and Equipment.

The main entrance is in the north end, opening into a small hall, to the left of which is a supply room, 7 feet by 19 feet, equipped with ample shelf room, and intended to contain all spare parts and supplies needed in the laboratory. From this hall a flight of cement stairs leads to a large room in the basement, 16 feet by 30 feet, and intended for a general carpenter's workshop for the college as a whole. At the right of the hall is a dust-proof grinding room, 19 feet by 22 feet. In this room is placed all the fine grinding machinery necessary to sample and reduce coal and ores to a suitable size and quantity as needed for assay or analysis. In the centre of the room is a large block of concrete, 10 feet by 10 feet, intended for a sampling floor. At the south end of the room is placed the following machinery:—

1 Braun Chipmunk Crusher.
1 Braun Disc Pulverizer.
1 Rotary hand grinder.
1 Allis-Chalmers type B sample grinder.
1 Gates rotary sample crusher.

The whole is driven from a line shaft to which is belted a 5 h.p. Westinghouse A. C. motor connected with the power line of the Electric Tramway Co. In the north end of the room are placed two iron bucking plates; while on the sides, room is left for various samplers and a closet for screens, brushes, etc. This room is a full unit in itself and can be run independently of the rest of the laboratory. From the hall already mentioned, one passes upstairs into another small hall. At the left of this upper hall is a small lavatory, 14 feet by 9 feet. It has a concrete floor and is equipped with a wash basin, shower bath, and closet, each being enclosed in a separate compartment with slate sides. Across the room is a row of lockers in which the students may keep their street clothes while working in the laboratories. Beyond this lavatory and in the northwest corner of the building is a small laboratory, 19 feet by 12 feet. This is at present not equipped, but will contain apparatus for testing coal mine gases, a sink and float machine for testing the availability of coal for washing, etc., etc.

At the left of the upper hall is a large space, 52 feet long and 19 feet wide. This will be finished into several rooms as needed. The present intention is to have the Professor's office at the east end, next to which will be a combined map-room, catalogue library, and drafting-room. Between this room and the hall, space is left for a class-room. Thus students at work in the laboratory below will be able to have their lectures and class-room work without going out of the building, and in the lavatory will also be able to wash and change their clothes before going to the regular college work in the other buildings. This completes the finished parts of the building. The rest is left with rough, unfinished walls, approaching, as has been before stated, the factory or mill type of construction.

In the main part of the laboratory in the northeast end of the building is a long, low room, 50 feet by 19 feet. Teams may drive through the doors into this part of the building, thus facilitating the unloading and storing of commercial quantities of ores and coal which the laboratory will handle. To the south of this is a long, open space, where the heavy crushers will be placed. Beyond this again, to the south, is a long concrete wall, extending the entire length of the building and giving a drop of 9 feet 6 inches into the south half of the laboratory.

The eastern end of this large south half of the laboratory approximately, 24 feet by 52 feet, will be devoted to thermometallurgy. It is the intention to erect in

*Director Technical Education for Nova Scotia.—This article is from official report.

this space a small laboratory blast furnace similar to the type adopted in other colleges, together with a small roasting furnace, a coke oven and furnaces to demonstrate heat treatment of steel and other metals.

To the west of this large space is a laboratory coal washing equipment. This complete coal washing equipment is of the most modern design, and was made by the Jeffrey Manufacturing Co., of Montreal. It is similar in every detail to the ones they have installed for the United States Government Coal Testing Laboratories. The description of the washer is as follows:—

The coal is shoveled into a 10-inch x 24-nch coal crusher, which has a capacity of about three tons per hour, and which can be adjusted to give a varied product from 5-8-inch cubes down. The coal is discharged into a chute, which delivers it into the boot of an elevator. A spiral jaw clutch is provided so the elevator may be cut out when it is not necessary to run. The coal is discharged from this elevator into a revolving screen, which is 2 feet 0 inches diameter x 5 feet 11 inches long. This screen is arranged to give three products: first, coal that will pass through 1-8-inch mesh; second, coal that will pass through 3-8-inch mesh, and third, the trailings, which will vary according to the adjustment of the crusher.

The three sizes of coal will each fall into a separate bin over the washer. A valve is provided for each compartment so that one product may be delivered to the bin over the washer at a time.

The bin over the washer has a gate, which may be opened to the necessary width and locked, thus giving the proper flow of coal to the jig. This jig is of the Luhrig type, and is about 1-4 the size of the standard jig, is made of ship-lapped cypress lined with maple and caulked to make a good water-tight tank. When washing nut coal, the plunger is to be run at 80 strokes per minute, and when washing fine coal is run at 120 strokes per minute. Two pulleys of different sizes are arranged for this and belts can be easily changed from one set of pulleys to the other. The washed coal flows into a sludge tank, which is made of cypress. In this a partition is placed so as to form an elevator compartment and fresh water compartment. The fresh water and the clear water which has been cleared in the tank is pumped back into the jig and used over again. The settlings are scraped up by a Century bucket elevator, which delivers the coal into the washed coal bin. The washed coal bin is to have a storage capacity of about 1,250 lbs. and to be provided with a slide valve in bottom. This machinery requires about 10 h.p.

This installation will doubtless be of great advantage, not only to the students, but to the Nova Scotia coal mining fraternity as a whole.

To the west of this coal washing equipment is the ore crusing and concentration plant. In this section of the laboratory gold ores may be tested for amalgamation, concentration, or cyanidation. Ores such as copper, zinc, lead, tungsten, manganese, etc., may be tested as to the most economical and commercially profitable method of extraction.

The general equipment consists of:—

1—7-inch x 10-inch Blake rock breaker,

1—style O D Gates Gyratory breaker, which will take the product already broken by the Blake crusher and reduce the same to a size suitable for stamping, crushing by rolls, or grinding in a Huntington mill. The remainder of the machinery will be mentioned in the general mill schemes below.

The general course of treatment of a concentrating ore might be as follows:—Broken first in the Blake crusher and the Gates breaker, above mentioned, then running by gravity to a set of 10-inch x 12-inch laboratory rolls, which are placed below the retaining wall, from these rolls the ore is elevated to the top of the mill and dumped into a set of three standard trommel screens. The elevator is a 6-inch vertical mill elevator, single head, equipped with malleable iron elevator buckets and rubber bucket belt, and is 26 feet centre to centre of pulleys. The trommel screens mentioned are complete with housings, receiver, and perforated metal covering. They will so size the ore that the coarse may be sent to the Huntington mill for regrinding, and the medium size may be sent to a two-compartment laboratory size Harz jig, which may make three products—concentrates, middlings, and tailings. The elevation of this jig is sufficient to allow the flow of either the middling or the tailing product back to the Huntington mill for regrinding. This section of the mill when complete, will also include one of the new types of jigs, viz., a Richards pulsator jig, in which there is great interest taken by mining men. This machine has been requested by several prominent mining men in the province. The products from this jig may be handled as has been described for the Harz jig. The finer products of the trommel screens pass either through a hydraulic cone classifier or else directly from the trommels to a laboratory size Wilfley concentrating table, and to a standard 4-foot Frue suspended vanner.

The slimes will pass to a James Slime Concentrator, which machine has been presented to the college by the manufacturer, The James Ore Concentrating Co., of Newark, N.J.

To the west of the concentrating unit comes the stamp milling unit. The gold ore to be treated can be coarsely broken in crushers above mentioned, weighed and dumped by gravity into the Hendy Challenge feeder, which feeds directly into a battery of 5 stamps. This battery is complete in every detail and is in all respects like the commercial stamp battery unit, with the exception of the weight, which is 300 lbs. per stamp. The crushed pulp issuing from the battery flows over an 8-foot amalgamation plate; thence to a trap, and from this trap the pulp is picked up by a standard Frenier spiral sand pump, which elevates the crushed gold ore pulp to the classifier before mentioned. From this machine the pulp can be concentrated by the same Wilfley vanner or James table as in the other mill scheme.

To the south of the concentrating and stamp mill units are steam dryers and a space about 20 feet x 40 feet, at present not equipped, which is left for the future growth of the laboratory as need requires. A small part of this space is taken up by an experimental cyanide plant and magnetic concentrator.

The space at the extreme west of the building, about 24 x 52 feet, is to be devoted to apparatus unique in the history of university metallurgical laboratories. This part of the laboratory is equipped with a 30 h.p. upright tubular boiler. Steam lines from this boiler lead to a 10-inch x 10-inch x 10-inch Ingersoll straight line air compressor with a capacity of 180 cubic feet of air per minute. With this compressor is a small air receiver. It is the intention to use this compressed air for the study of the many compressed air problems which constantly confront a mining engineer, and also to enable the student to familiarize himself with the actual work-

ing of rock drills, coal cutting machines, and other air-driven machinery. This type of machinery is sure to present itself to the student immediately upon beginning his first practical work, and it is hoped that the opportunity of familiarizing himself with the same while in college, will prove of great benefit to the young engineer.

The other steam line mentioned as leading from the upright boiler, goes to a small Lidgerwood mine hoist, equipped with double cylinders (5-inch x 6-inch), and with a 10-inch single friction drum and a reversing link motion. With this hoist it is intended to handle all heavy material moved in the laboratory, as well as to operate a model hoisting plant consisting of a small model mine cage and a small head frame. The necessity of students' correctly understanding this class of machinery is apparent.

With the exception of a few minor pieces of apparatus, this completes the equipment of the laboratory.

A part of the machinery needed for the installation described is on hand at the college, a part has been purchased from the mining laboratory connected with Dalhousie University in this city, and a part has been ordered from Allis-Chalmers-Bullock, of Montreal, who have equipped most of the mining laboratories in the United States and Canada.

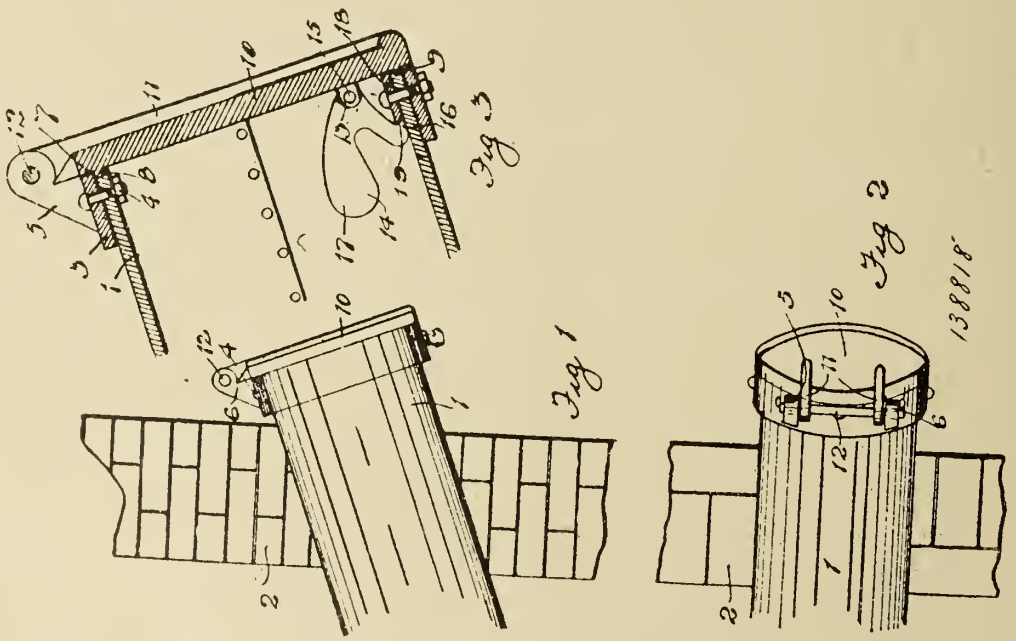
It is not intended that the laboratory shall be complete in every detail at once, but provision has been made for the purchase of such new machines as are constantly making their appearance in the mining world, and which may be deemed of benefit for the instruction of students, and the general mining public.

Part of the apparatus will be in working order for the second term of the present college year, and by the opening of the college year in the fall of 1912 the Technical College will offer to the mining student a laboratory not excelled in completeness by any college laboratories in the United States and Canada within our knowledge.

NEW CANADIAN PATENT RELATING TO MINING AND METALLURGY

The February Canadian Patent Office Record contains a number of very interesting new patent specifications. Herewith are presented a few:—

Patent No. 138,858 is taken out by Firman Thompson, Newark, N.J. It covers a process for obtaining potash salts from feldspar. The process consists essentially in reducing the feldspar to powder, mixing therewith sodium acid sulphate and sodium chloride in the approximate proportions of five parts of feldspar, five parts of sodium acid sulphate, and one and eight-tenths parts of sodium chloride, heating the mixture to bright red heat, cooling, reducing again to powder and leaching with water to remove the potassium and sodium sulphates. The heating lasts for from one to two hours. The potassium sulphate is finally separated from the sodium sulphate.



No. 138,818 Coal Chute.

Patent No. 138,818, granted to Lewis Carroll Gibboney, Portage la Prairie, Manitoba. As seen in the

accompanying illustration, it consists of a chute with a lid hinged to the upper end, a locking plate secured permanently to the inner face with its inner edge V-shaped and a catch-piece pivotably secured to the inner face of the lid. The long arm of the catch-piece forms a handle, and the short arm a tooth to pass behind the V-shaped edge of the plate and lock the lid against the end of the chute.

Patent No. 138,442 is granted to the Nichols Copper Company, assignee of John B. F. Herreshoff, New York. It is an ore roasting furnace consisting of a casing with superposed floors and a hollow upright shaft in the centre of the casing surrounded by a sleeve. Rabble arms are fixed to rotate with the shaft. The arms have interior channels communicating with the interior of the shaft and sleeve respectively. The driving mechanism is connected with projecting portions of the sleeve and of the shaft. The internal channels are for the purpose of cooling.

Patent No. 138,497 covers a process and apparatus for recovering gold. It is granted to James H. Alling, Columbia, California. The process consists in recovering gold from its ores by mixing the finely crushed ore with a chlorine compound, immediately thereafter causing the mixture of solution and pulp to flow in succession freely in contact with a series of mercury cathodes, passing currents of electricity through the flowing mixture to said cathodes, the amount of chlorine compound and the magnitude of said currents bein gsufficiently great to liberate nascent chlorine in sufficient quantities to reduce the gold to a condition in which it is readily amalgamated, and recovering the gold from the cathodes.

Patent No. 138,432 is granted to the Northern Explosives Company, Limited, Montreal, assignee of Arthur Hough, Lavigne, Quebec. An explosion and the process of manufacturing it are covered. The explosive consists of sodium nitrate, coal, and sulphur, each in distinct granular, non-absorbent form, and a mixture of tri-nitro-glycerine and penta-nitro-tri-glycerine. The process of manufacturing consists in treating glycerine and converting a part thereof into triglycerine, nitrating, washing and rendering stable the product, and mixing it with sodium nitrate and coal in the following proportions: Penta-nitrate-tri-glycerine, 6 parts by might, sodium nitrate 65 parts, and coal 25 parts. —J. C. M.

TIN MINING IN NIGERIA

From a London Correspondent.

London, May 20th, 1912.

In these days of recurrent tin booms and a clear scarcity of material it is not to be wondered at that the search for new tin-bearing areas proceeds apace. Northern Nigeria has come along during the last twelve months as a proposed prominent source of supply, and has had to make its way in the advertising of strong views as to its value expressed in important quarters. With over one hundred companies, however, now formed operating on the London Stock Exchange and a perpetual stream of travellers between England and Bauchi, where the tin is, in Northern Nigeria, a quantity of information is to hand at last which serves to show that although caution is still required there is abundance of tin in that capacious portion of King George's West African dominions.

The great trouble so far has been transport, and the fresh and important development in this direction is the completion of the Baro-Kano Railway, a branch running from Zaria on the main Northern Nigerian line for a distance of about 100 miles to the Nigerian tin fields, and intended at present to terminate at the foot of the Bauchi Plateau upon which the tin claims are located. Hitherto the inaccessibility of the tin-bearing grounds of Northern Nigeria has been the great impediment in the way of development for transport, both of men and materials, has been a very troublesome and expensive affair. For instance, the transport of tin from the mines to Liverpool has cost upwards of $150 a ton, natives carrying the metal in parcels of about 60 pounds weight on their heads to Loko, on the Benue River, where it was put into small steamers or barges, transhipped at Lokoja into the Niger boats, and taken to Forcados for ocean transit. With the completion of the Baro-Kano Railway and the construction of a road from railhead to Bauchi, the cost is reduced to a little over $90.

That Nigeria has a future as an important tin producer there is no doubt, and it is regarded as significant that the deposits of the district bear a striking similarity to those of the most prolific producer in the world, the Federated Malay States, which continue to supply considerably more than half of the world's requirements. The Nigerian deposits consist very largely of alluvial, although lodes are found in certain localities. Lode mining, however, has not been of much account in the Middle East, alluvial deposits providing the enormous preponderance of supplies. The first tin discovered in Nigeria was in the form of coarse and fine grains found in river beds, and the opinion was early formed that the metal had come originally from granite in the slopes and at the base of the foothills. In a primitive fashion, and in very limited quantities, Nigerian tin filtered through to Europe first in the early days of the Niger Company, reaching England in the curious form of small faggots. The method of production was interesting, none-the-less because, with the advance of European methods, it tends to become obsolete.

The natives were fully aware that the metal had a very distinct commercial value and for their purposes a party of them would walk into a stream, and after stirring up the gravelly bed with a kind of hoe would scrape it up in a calabash and wash the contents, thus, in a rough and ready way, concentrating the tin stone. This was then smelted in a furnace of very primitive character fed by charcoal, the blast being furnished by bellows made out of a sheepskin. When the tin melted it was caught and poured on to a clay bank

which had been perforated with holes made by the haulms of the Guinea corn. A bundle of faggot-like sticks of tin was thus produced, which were tied together, and eventually reached the coast.

The origin of this tin for a long time puzzled the authorities of the Niger Company, who decided thoroughly to investigate the source from which the metal was derived, and eventually Sir William Wallace, late acting Governor of Northern Nigeria, after subduing the Emir of Bauchi, managed to get messengers through to Naraguta, who returned with a small sample of alluvial tin. This was in 1902, and the directors of the Niger Company were so impressed that they very soon took out a prospecting license over a thousand square miles, and within a year or so several expeditions were despatched, with the result that tin was found in the Province of Bauchi, while subsequent examination located extensive tanniferous areas.

According to R. C. Nicolaus, the geology of the area is composed of granite, igneous intrusions of diabase, and porphyry, forming the prominent peaks of the Naraguta and Shere Hills. Near the river a coarse grey gneiss forms a contact with the granite, both of which roks are traversed by lenticles and gash veins of quartz and several small igneous dykes cross diagonally the general strike of the country. Mr. Laws, the engineer in charge, was so satisfied with the investigations that upon his representations the Niger Company applied in 1905 for a number of mining leases, and since then the tin industry of the Protectorate has never looked back. Official reports upon specimens from the Zagi River, south of Bauchi, from Bula, Tilde, and the river beyond Joss, forwarded to the Imperial Institute were to the effect that the gravel was more or less rich in tin over the whole surface of the plateau, while tin stone was widely distributed throughout the province.

Alluvial mining, however, is in a general way somewhat precarious; but as regards tin, whatever may be the theory the practice has invariably that alluvial mining pans out better than lode mining. Still, the famous Dolcoath and other Cornish mines are lode propositions, and so also are the big deposits of Bolivia; but as mentioned already, the largest producer is the Federated Malay States, where practically all the tin is won from alluvial deposits. The fact, however, that lode mining in the East has proved disappointing does not necessarily justify pessimism regarding the lode formations of Nigeria; investigations made,indeed,leading to very encouraging estimates being formed as to the highly profitable character of the West African formations. It stands to reason that wherever alluvial tin is found it came from lode deposits somewhere or other, and with the discovery of these the enormous value of Nigeria as a tin producer should become established.

Tin is one of the few metals the production of which during recent years has increased very slowly, and the gravest apprehensions have been felt in the trade regarding the absence of new discoveries in face of the ever-increasing consumption. The tin market has always been the scene of active speculation, which for a long period has centred chiefly in the hands of a Continental group, and the erratic movements of prices brought about by their operations have frequently mystified and greatly worried consumers. Within the last few months, however, certain steps have been taken in connection with speculative contracts, calculated, it is believed, to insure greater steadiness and stability in prices. At all events, there has been a notable diminution in the merely speculative transactions which have been opened up, while the price has remained firm in the neighbourhood of $950. High though this price may appear to be, it in all probability fairly represents the approximate value, for consumption is ever increasing at a greater ratio than output; and unless considerably more tin is forthcoming, either from Nigeria or elsewhere, the time is approaching when even to-day's level of prices may appear reasonable.

Tin, as a metal, stands in a class almost by itself. In its pure form it is hardly used at all, passing into consumption as it does, alloyed with, or in close association with other metals. The most important branch of consumption is, of course, the manufacture of tinplates, thin sheets of steel coated with tin. Of a box of tinplates weighing one hundredweight net, about 110 pounds consists of steel and two pounds of tin. There are many makers who use less than two pounds of tin per box. It will be seen from this that the rise even of $250 per ton in the price of tin can have no appreciable effect on the cost of the tinplate used in packing a box of sardines, a tin of pineapple, or a tin of tooth powder. Hence, it is that the inevitable tendency of high prices to restrict consumption operates far less injuriously upon tin than upon most other commodities. Equally also does this apply to the engineering trades where the metal is used to produce anti-friction compositions for use in bearings.

Having regard, however, to the prospects for an extended use of the commodity and the maintenance of high prices, there should, no doubt, be ample room for legitimate mining enterprises in Nigeria, always assuming that they are soundly and honestly conducted and are not over-capitalized.

COPPER-NICKEL DEPOSITS IN SOUTH AFRICA.

The occurrence of copper ores at Mount Ayliff, in the Susizwa Range, East Griqualand, has been known to prospectors for some years past; and some tentative, but not particularly successful exploration has been attempted. A recent report on the region by the Cape Geological Survey has, however, served to stimulate interest by directing attention to the similarity of the ores, and of their mode of occurrence to those of Sudbury. The ores, like those of Sudbury, can generally be separated into two groups, one consisting chiefly of chalcopyrite, and the other richer in pyrrhotite and pentlaudite. The assays have shown the copper to average 4 per cent., nickel 3.8 per cent., and platinum, in the form of sperrylite, 2½ dwt. per ton. The probable extent of the deposits has not yet been determined.

GRAPHITE IN THE UNITED STATES.

The United States production of graphite was 3,618 short tons for the year 1911. This represented a value of about $300,000. The imports during the same year totalled 20,702 short tons valued at $1,495,729. The greater part of the domestic production of crystalling graphite comes from the states of New York, Pennsylvania and Alabama.

THE ELECTRICAL EQUIPMENT OF A SOUTH WALES COLLIERY*

From an electrical point of view, the most interesting of the group of collieries is the new Britannia colliery at Pengam, which is now in process of sinking, and is at present entirely without steam plant, as power is derived entirely from the Bargoed and Penallta generating plants, where a pair of the largest electric winding engines in the world are at work. As at Penallta, a prominent feature is the collection of all the machinery under one roof, but there is the important difference that the whole plant is electrical. The inclusion of winding plant in the same engine-room as other machinery is one of the points dealt with in the new Coal Mines Bill, and it is possible that, if the Bill in its present form becomes law, screens may have to be erected across the engine-room both here and at Penallta to isolate the winding-engines from the rest of the plant, although it may be that, in view of its quietness, electrical plant may be exempted from this requirement. A plan showing the arrangement of the plant is given in Fig. 3.

The sinking of these two shafts was commenced in June, 1910, with cranes, but when a depth of 185 feet was reached a pause was made till the completion of the electric winding plant, but sinking operations have recently been recommenced with the winding engines, which have been fitted with temporary drums for the purpose. The winding plants are on the Ilgner system, and were supplied by Siemens Brothers Dynamo Works, Limited. Almost the whole of the electrical plant was made at the Stafford Works, and the mechanical parts of the gear, such as the drums, brakes, etc., were made by Messrs. Fraser & Chalmers as subcontractors. Indeed, it is notable that, with very minor exceptions, the whole of the new plant, both here and at Penallta, is of British manufacture.

The Ilgner system of flywheel storage, as applied to winding engines driven by continuous current motors with variable voltage control, is now well known, and is employed in a very large number of winding plants on the Continent as well as several in Great Britain. The present plant is an example of the modification in which the flywheel is attached to a motor-generator consisting of an induction motor of the slip-ring type driving a pair of continuous-current generators, which supply current to the two large slow-speed motors direct coupled to the winding drum. The speed and direction of motion by the winding motors is controlled, as in the Ward-Leonard system, entirely by operating on the field of the generators, the armature circuits never being broken. The capability of the flywheels to store and give out kinetic energy is rendered available for storage of energy in the following way:—When the set is running light the flywheel runs at its full speed, the induction motor having as little slip as possible, but when a heavy call is made for power the "slip regulator" comes automatically into action, and switches resistance into the motor circuit, slowing down the set and allowing the flywheel to give up energy. When the demand for power decreases the converse takes place, resistance is switched out, and the motor and flywheel rise in speed, drawing power from the power station. Thus, notwithstanding the enormous peaks in the load on the winding motors, the current drawn from the station can be reasonably constant—and the plant capacity necessarily is far less than would be required were no such power storage available. Also it will be readily seen that the method of control by variation of the voltage applied to winding motors

renders regenerative braking possible, with a considerable saving in power consumption, as well as permitting of a single lever to accomplish the whole of the starting, stopping, speed regulation, and electric braking.

This brief reminder of the general principle of the Ilgner system as applied by the Siemens firms will elucidate the relations between the ratings of the machines forming this equipment. Each winding drum is coupled to two motors, one at each end, and each is rated at a maximum horse-power of 2,160 and a normal output of 1,300 horse-power, they run at a maximum speed of 62.8 r.p.m., and the voltage at the armature terminals varies from 0 to ± 600. They are separately excited from a 220-volt circuit derived from separate motor generators. They are 16 pole machines with interpoles as well as distributed compensating windings to perfect the commutation, and the commutators are built in two portions, with ventilating channels between them.

The two flywheel sets, one for each winding plant, consist each of an induction motor, two continuous current generators, and a 33-ton solid steel flywheel running at a maximum speed of 500 r.p.m., and capable of storing 30,000 foot tons. The two sets are placed in line, and can be coupled together, so that when both plants are winding coal each will assist in dealing with

*Reprinted from "Electrical Engineering," November 2, 1911.

the peaks of the other. Further couplings are provided between each motor generator and its flywheel, so that the set can be run in any one of the following ways:—Either motor generator alone with one or both flywheels or without a flywheel, both motor generators entirely without flywheels, or the whole coupled up together. The flywheels are cased in, and their bearings are water-cooled with ring lubrication, auxiliary pressure oil lubrication being provided for starting up and in case of emergency. At present, during sinking, only one motor generator is in use, each of its two generators supplying a single motor on each winder. Also the induction motors have their stator circuits temporarily connected in mesh, with current transformed down to 3,000 volts on their terminals, whereas when winding is in full swing they will be star connected and supplied at the full transmission pressure of 10,000 volts. When coal is being raised from the full depth of 2,190 feet at the full rate of one complete wind per minute, or 360 tons per hour, the maximum demand of the winding motors will be about 4,850 h.p., but the constant load put into each motor generator will not exceed 1,850 h.p. The two generators (one for each winding motor) on each Ilgner set are designed for 1,730 kw., or 2,830 amperes maximum, and 1,035 k.w. or 1,720 amperes normal, at 425 to 500 r.p.m., and work up to 600 volts. They are eight-pole machines with interpoles, compensating winding and double commutators similar to those of the winding motors. The excitation of the generators is drawn from separate motor-driven exciters, but a battery is provided as stand-by capable of allowing the winding engines to continue working after a cessation of supply until the energy stored in the flywheels is spent. The battery serves also as a stand-by for lighting.

The induction motors are designed for 10,000 volts, 91 amperes per phase, and an output of 1,750 h.p. continuously. The slip-ring voltage reaches 700 volts and the machines are of the enclosed self-ventilating pattern, drawing air from below the floor and expelling it through apertures around the stator frames. The slip regulators are of the liquid type, controlled by series transformers in the motor circuits, the secondaries of which supply current to a small induction motor unable to revolve, but arranged to cut in or out more or less of the liquid resistance, according to the torque on the motors.

The winding engines are provided with devices for preventing too rapid acceleration and overrunning by mechanisms which interlock the depth indicator and the control lever, thus making it impossible for it to be put over too rapidly at starting, and returning it to the zero position automatically at the end of the wind and applying the brakes, should the driver omit to do so. Excellently arranged mechanical working and emerging brakes are provided, actuated mainly by compressed air and electrically interlocked with the current supply, in addition to the provision for electric braking.

The main switchgear is of the Siemens pillar type, similar to that at Penallta. The 10,000-volt bus-bars are arranged in a ring with two sections. Each section has one incoming feeder from Bargoed or Penallta, and if there should be a failure on any part of the board, supply can be continued through another portion. The 3,000-volt gear is of generally similar construction, and a separate 500-volt board provides for the smaller motors and a continuous-current board contains the necessary connections and instruments for the winding engine circuits.

The duplicate overhead 10,000-volt line from Penallta is of 0.25 sq. in. copper, designed to transmit 2,000 kw. at 0.7 power factor with a 4 per cent. drop of pressure. Similar sized lines are brought from Bargoed, and the Merz-Price system of protection with Reyrolle relays is used for all the overhead lines as well as for the large transformers.

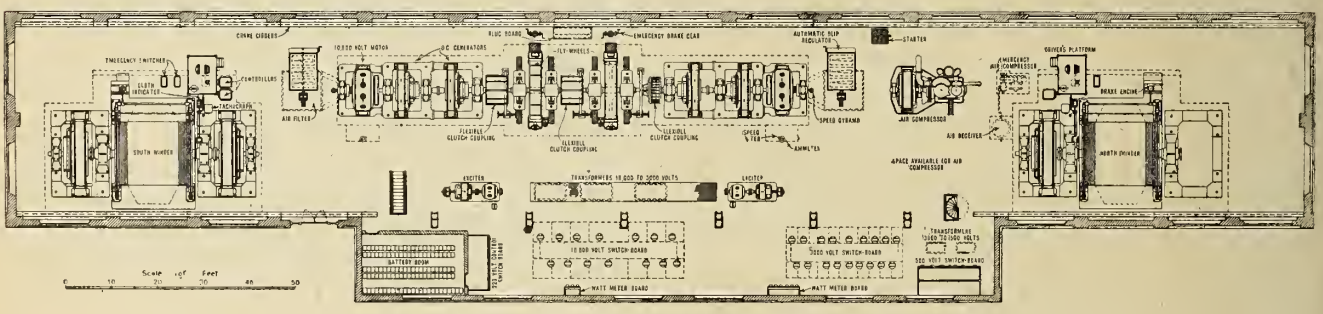


Fig. 3

There is also in the main engine-room a Belliss & Morcom air compressor, driven by a 3,000-volt 400 h.p. motor running at 290 r.p.m., and other electrically driven plant at the colliery includes temporary hoists for the staging, etc., used in the sinking of each shaft, driven by 130 h.p. motors, and another temporary air compressor driven by a 130 h.p. motor

The plant at this colliery was visited on September 14th by a large party of members of the Institution of Mining Engineers and others on the occasion of the annual meeting at Cardiff, and the Powell Duffryn Company, who are justly proud of this example of up-to-date mining electrical engineering, showed much kind hospitality to the party. It is to the opportunity thus afforded and to the personal assistance of Mr. C. P. Sparks, under whose supervision as consulting engineer the work was carried out, that we are indebted for the material that has enabled us to compile this article, with the kind permission of Mr. G. Hann, the manager of these collieries.

THE ORE AND COAL-BEARING FORMATION OF THE YUKON

Among the papers presented at the Fourteenth Annual Meeting of the Canadian Mining Institute, held in Toronto last March, was one by Dr. D. D. Cairnes, of the Geological Survey of Canada, on "The Ore and Coal-Bearing Formations of Yukon Territory."

This was a compilation of information concerning the economic geology of Yukon Territory, in which attention was drawn to the formations that have been found to be of economic importance, and their extent shown so far as known. The intention in preparing the paper may be taken to be an endeavour to assist in future prospecting and development of the mineral-bearing formations noticed. Particular attention was paid by Dr. Cairnes, in his paper, to coals of Yukon Territory, for the reason that they are not so well known as its placer-gold and lode deposits.

The following table shows the extent of the **known** Tertiary and Jura-Cretaceous beds in Yukon Territory; also the **probable** extent of such beds. Further, it indicates the probable amount of coal—lignite, bituminous and anthracite—contained in the beds mentioned.

Extent of Beds and Coal Contents.

	Square Miles
Extent of known Teritary beds in Yukon Territory	2,090
Extent of known Jura-Cretaceous beds in Yukon Territory	4,110
Total	6,200
Probable extent of Tertiary beds in Yukon Territory	4,500
Probable extent of Jura-Cretaceous beds in Yukon Territory	19,700
Total	24,200
	Tons
Probable amount of lignite in seams exceeding one foot in thickness in Tertiary beds	3,134,770,000
Probable amount of lignite, bituminous coal, and anthracite in seams exceeding one foot in thickness in Jura-Cretaceous beds	190,520,000
Total	3,325,290,000

It will be observed that the **known** extent of beds is but 6,200 square miles, while the **probable** extent of beds in the area known to contain coal is nearly four times as large. This "probable extent" of known areas does not include any unexplored portion of Yukon Territory, but signifies only what is expressed, namely, the probable extent of areas known to contain coal.

Known Coal-Bearing Areas.

The coal fields of Yukon Territory have not yet been worked extensively, for the aggregate output of coal from these to date may be placed at approximately only 100,000 tons.

The Tantalus field is the most important Cretaceous area, and is one of the two in which most development work has been done and production of coal made. This contains a considerable amount of coking coal. Other important Jura-Cretaceous areas are Whitehorse and the Braeburn-Knocks area, the latter a large area discovered by Dr. Cairnes, situated 50 to 60 miles north of Whitehorse.

The most important Tertiary area known is that of Rock Creek, the southern end of which area is just east of Dawson City; this area extends about 70 miles in a northwesterly direction from that point. Other important Tertiary areas occur on Indian River, Peel River, Porcupine River, and the Liard and Francis Rivers.

Coal has been found at different places on the Arctic Coast, explorers having brought in from that outlying region samples of coal discovered by them. It is known that the area of coal-bearing rocks is extensive up there; but it has not yet been determined whether they are Tertiary or Cretaceous.

Note.—Supplementary to the foregoing, the following information may prove of interest:

In his report for 1906 (See "Summary Report of the Geological Survey Department of Canada, 1906." pp. 28-30), Dr. Cairnes states that the Tantalus mine is situated on the west side of Lewes River, about 190 miles down the river from Whitehorse, being somewhat less than half way to Dawson. Three workable seams had then been found. The coal was worked by pillar and stall system; it was dirty, but could easily be sorted. "These measures are quite regular, and can be traced for more than 20 miles down the Nordenskiold River to the south, and more than 10 miles to the north, showing that there is an enormous amount of coal in this district; when the measures have been prospected they may be found to extend much farther. Only coal near the river is, at present, of economic value. The dips are to the east and vary from 24 to 40 degrees. Samples taken show the coal to be a bituminous coal that yields an average of about 75 per cent. of a firm coherent coke."

Brief reference is made to this field in the "Summary Report" for 1907, while in that for 1908 more information is given, an excerpt from which follows.

"There are two coal-bearing horizons of economic interest in this portion of Yukon Territory. An upper horizon occurs near the top of the thick assemblage of conglomerate beds forming the upper half of the group of Cretaceous sediments, and to this higher zone belong the seams at the Tantalus mine and on Tantalus Bluff. A second, lower coal-bearing horizon lies toward the base of the Cretaceous column as seen at the Five Fingers mine, situated about 8 miles north of the Tantalus mine, also at a point west of the 69-mile post from Whitehorse on the Whitehorse-Dawson Road and elsewhere.

"The seams of the Tantalus Bluff and the Tantalus mine doubtless extend a number of miles to the north and south of these places, but prospecting for coal is rendered particularly difficult there by the thick mantle of glacial and recent alluvial material which covers the greater part of the district. Beginning within a distance of two or three miles south of Tantalus, the Cretaceous sedimentary rocks are, for the greater part, covered with more recent Tertiary basalts, basalt tuffs, etc., so that although in the 20 miles immediately south of the Tantalus mine there is believed to be a great amount of

coal, it will, in most places, require very careful prospecting to find it suitably located for mining purposes."

It may be added that a few weeks ago there was printed in the Daily Alaskan newspaper, Skagway, information to the effect that the general manager of a company operating coal mines at Tantalus and Five Fingers had returned from "the outside," and that he had purchased from The Jeffrey Mfg. Company, of Columbus, Ohio, a washery and screening and conveying plant to handle 400 tons per ten hours, which new plant is to be installed and ready for work by the middle of July. He also intimated that his company is providing for making coke, there being much copper ore in Whitehorse camp and other parts of Yukon Territory.

BOOK REVIEWS

INTRODUCTION TO THE STUDY OF MINERALS.—A combined Text-Book and Pocket Manual, by Austin Flint Rogers, Ph.D., 522 pages, profusely illustrated, price $3.50 net. McGraw-Hill Book Company, New York—Book Department, Canadian Mining Journal, Toronto. 1912.

Dr. Rogers' compact and substantial volume is planned to cover the requirements of a one-year course in mineralogy. While a great mass of detail has been omitted, the aim of the author is sufficiently comprehensive. The distinctive features of the book are these:

1. The description of the optical and microscopic properties of crushed fragments, clearage flakes, and crystallized products.
2. Six new determinative tables.
3. A numbered list of the occurrences of each mineral, establishing paragenetic varieties.
4. A glossary of terms, synonyms and varieties.

Other departures are the emphasis laid upon symmetry, and dropping the idea of hemihedrism. Miller's indices are used exclusively.

The text is prefaced with a select, classified, bibliography. The topical arrangement of the text itself is lucid. The form of minerals; their physical, optical, and chemical properties; their delimination; description (200 species); their occurrence, association, and origin; and their uses, are the headings of successive chapters. The six new tables give, respectively, the arrangement of minerals according to crystal system or habit; according to structure and cleavage; according to colour; according to specific gravity; according to optical tests; and according to blowpipe and chemical tests.

The glossary is a particularly useful addition. It comprises 24 closely printed pages, and constitutes the most useful source of reference that has come to our notice. "Study of Minerals," inasmuch as it is a carefully arranged exposition of the elements of mineralogy, and is stripped of all superfluities, has a field to fill.

As to typography and general make-up, there is little to be desired.

The Canadian Klondike Company, Ltd., commenced operating with its small dredge during April, but it was not expected that its big dredge would be at work until early in May. This company owns the Boyle concession and other claims in the Yukon.

The Yukon Gold Company will work eight gold dredges this season. Its holdings include all the more important deposits of gravel on Hunker, Bonanza, and Eldorado creeks and their tributaries.

According to The Daily Alaskan, published at Skagway, Alaska, among other contracts for carrying freight from Skagway to Dawson this season the manager of the White Pass and Yukon Railway has closed are two, together of 5,500 tons—4,000 tons for the Boyle concession and 1,500 tons for the Guggenheims' camps.

The United States Smelting, Refining and Mining Company of Maine, a $75,000,000.00 corporation operating mines, mills and smelters in various parts of the United States and Mexico, has established an exploration department with an engineer's office in Seattle, for the examination and purchase of meritorious metal mines in Alaska and the Northwest. Communications should be addressed to D. D. Muir, Jr., superintendent in charge, 1303 Hoge uilding, Seattle, Washington.

The Butte, Montana, correspondent of the London Mining Journal, writing on April 13, contributed to that publication the following relative to the Peterson Zinc Process: "A zinc smeltery at Butte is among the possibilities, and the company likely to undertake the construction will be the Butte & Superior. Some time ago Captain A. B. Wolvin, president of the Butte & Superior, with D. C. Jackling, the big Utah mining man, and several experts, made a very thorough examination of the process for treating zinc concentrates invented by F. F. Peterson, a Butte man and graduate of the State School of Mines. The demonstration was such a satisfactory one that Captain Wolvin, after consulting with the directors of the Butte & Superior Company, decided to erect a small plant for experimental purposes, and it will be ready for operation in the course of the next two weeks. The heat in the furnace is to be supplied by electricity, and Peterson is positive that he will be in a position to show a saving of 95 per cent. in the zinc ore and about the same percentage in copper and gold. If the new process should be a success, it will undoubtedly prove a great saving, as at the present time it is costing the Butte & Superior Company $40 a ton to have its concentrates treated at the Oklahoma smeltery. It is asserted that the cost for treating the concentrates under the Peterson process will be between $13 and $15 a ton. If it is demonstrated beyond doubt that the Peterson process is all that is claimed for it, the company will make arrangements for the erection of a smeltery at once to have a capacity of 500 tons of concentrate a day."

DOMINION STEEL CORPORATION, LIMITED—EXTRACTS FROM ANNUAL REPORT

Earnings of the Year.—The earnings of the Coal Company show a satisfactory growth, which there is every reason to expect will continue.

The Steel Company's earnings reflect the very unsatisfactory conditions of the iron and steel trade in the matter of prices, which, as a consequence of the depression in the trade in the United States, have marked the past year. The conditions as to bounties and duties have also affected the Steel Company, as a considerable portion of its product had to be sold in a depressed market in competition with duty-free imports from the United States.

Your directors have caused representations to be made to the Government as to these and other matters affecting the manufacture of iron and steel in Canada and are hopeful of an early removal of the serious anomalies in the tariff on these articles.

Production.—The increase in output has come up to our expectations. The figures for last year and for the twelve months preceding are as follows; but it is to be noted that the Cumberland figures for the earlier period were not normal, owing to the strike:

Coal Company.

	Year ending 31st March, 1912. Tons.	Year ending 31 March, 1911. Tons.
Cape Breton Collieries	4,063,395	3,752.298
Cumberland Collieries	342,868	109,863
Total coal	4,406,263	3,862,161

Steel Company.

	Tons.	Tons.
Wabana ore	602,168	544,792
Pig iron	290,588	248,715
Steel ingots	335,553	301,940
Rails	153,498	133,896
Wire rods	70,633	78,600
Blooms and billets for sale or stock	43,950	34,110

Extensions.—Capital Expenditure.

During the year they disbursed $123,369.91 for amount expended on new collieries and other property of the Coal Company in Cape Breton amounted to $1,576,931.70, and on the Cumberland property $23,353.01. Full particulars of the work under way were given in the circular sent you on 4th January last.

The operations at all the collieries have been carried on very steadily and satisfactorily throughout the year. The new mines in the Lingan District are making an excellent showing, both in tonnage and in the quality of the coal. The coal from No. 6 Colliery has greatly improved since the deeper parts of the seam were reached. There continues to be a good market for all the coal which the mines produce.

Explorations on the Cumberland property during the past winter have proved the existence and extent of a valuable seam of coal (known as the six-foot-seam) not hitherto worked, close to the town of Springhill, and the directors have under consideration the opening of at least one new colliery on this seam.

The development of the older collieries at Springhill has steadily progressed. At No. 2 the seam is 10 feet thick and of excellent quality; No. 3 does not show quite as favourably in comparison, but is in active operation and producing good coal.

Dominion Iron & Steel Company, Limited.—The expenditures on Capital Account during the year amounted to $2,714,539.56, in addition to which $1,400,000 was paid on account of the purchase money for Dominion Coal stock, leaving the final instalment of $350,000 still unpaid.

Particulars of the work in progress on the Steel plant were given in the circular of 4th January last. There have been still further delays, chiefly due to the inability of the contractors to finish their work in time; their delays were in some measure due to the large amount of work under progress in Canada. The wire and nail mills are very nearly completed and will be shortly in operation; No. 8 blast furnace and the new bar mill will follow during the summer.

Stock and Bond Issues.

In accordance with the arrangements sanctioned at the special meetings of the shareholders of the corporation and its constituent companies on 15th January, 1912, the corporation has issued 70,000 6 per cent. preference shares, amounting in all to $7,000,000, and has received $3,500,000 6 per cent. income bonds from the Dominion Coal Company, Limited, and a like amount from the Dominion Iron and Steel Company, Limited. These bonds will be held in the treasury of the corporation, as the primary source from which a revenue to provide for the dividends on the preference shares will be derived.

During the year your directors issued 2,500 shares of common stock for the purpose of acquiring the securities of a company which supplies lumber and other wood products to the Coal and Steel Companies.

Relief and Benefit Societies.

The affairs of these important organizations have steadily improved, and the scope of their operations have now been extended to include all employees of the Coal and Steel Companies at Springhill, Marble Mountain, and elsewhere.

During the year they disbursed $123,369.91 for benefits, insurance, etc., and on 31st March, 1912, their combined reserve funds amounted to nearly $180,000.

Staff.

The directors of the corporation and its constituent companies again desire to express their appreciation of the excellent service rendered by their respective officers and employees.

All of which is respectfully submitted on behalf of the Board of Directors.

J. H. PLUMMER,
President.

CONSOLIDATED PROFIT AND LOSS ACCOUNT.

For the Period of One Year and Nine Months from Commencement of Business on July 1, 1910, to March 31, 1912.

Net earnings, after deducting all organization, manufacturing, selling and administrative expenses, but before charging provisions for sinking funds and depreciation and interest		$7,388,260.51
Deduct—Regular provisions for sinking funds, exhaustion of minerals and depreciation		1,624,805.86
		$5,763,454.65
Deduct also—Interest on bonds and loans (less proportion chargeable to construction)	$1,957,878.67	
Proportion of discount on bonds sold	115,426.01	2,073,304.68
Net earnings for period		$3,690,149.97
Less—Dividends:		
On preferred stock	$ 979,999.99	
On common stock	1,225,204.00	
	$2,205,203.99	
Special appropriation for depreciation and renewals	700,000.00	2,905,203.99
Surplus, March 31st, 1912		$784,945.98

Note.—In consolidating these accounts, the amount of $2,049,393.60 of the constituent companies' surplus as at July 1, 1910, has been deducted from the cost of properties in the balance sheet.

PROFIT AND LOSS AND SURPLUS ACCOUNT.

Year Ending March 31st, 1912.

Net earnings from operations, after deducting all mining, selling and administrative expenses, but before charging provisions for sinking fund and depreciation and interest		$2,274,110.54
Deduct—Provision for sinking fund and depreciation		414,009.58
Balance		$1,860,100.96
Deduct also—Interest on bonds and loans	$375,897.55	
Proportion of discount on bonds sold	3,787.33	379,684.88
Net profit for the year.		$1,480,416.08
Add—Surplus at April 1st, 1912		668,530.99
Deduct—Dividends:		
On prefered stock	$210,000.00	
On common stock	600,000.00	810,000.00
Surplus March 31st, 1912		$1,338,947.07

PROFIT AND LOSS AND SURPLUS ACCOUNT.

Year Ending 31st March, 1912.

Net earnings and income, after deducting all manufacturing, selling and administrative expenses, but before charging provisions for sinking fund and depreciation and interest		$1,885,074.05
Deduct—Provision for sinking fund, exhaustion of minerals and depreciation.		466,633.22
		$1,418,440.83
Deduct also—Interest on bonds and loans (less proportion chargeable to construction)	$704,042.34	
Proportion of discount on bonds sold	63,099.82	767,142.16
Net earnings and income for year		$651,298.67
Add—Surplus at April 1st, 1912		2,369,375.33
		$3,020,674.00
Deduct—Dividends:		
On preferred stock	$350.000.00	
On common stock	800.000.00	1,150,000.00
Surplus 31st March, 1912		$1,870,674.00

THE EMILY EDITH MINE, SLOCAN, B.C.

The Emily Edith group of six mineral claims, covering an area of about 150 acres, situated in Four-Mile Creek camp, near Silverton, Slocan Lake, British Columbia, being now owned by the Standard Silver-Lead Mining Company, will be further developed in connection with the Standard mine, one of the productive silver-lead mines of Slocan district.

In 1900 the Emily Edith group became the property of the Emily Edith Mines, Limited, a company promoted in England by the new British Columbia Development Corporation, Limited, to acquire these claims. The purchase consideration was £55,000, of which the sum of £2,561 was paid in cash and £52,439 in fully paid-up shares. The company's authorized capital was £75,000, in shares of £1 each. There was called up ten shillings per share on the 22,561 shares not issued to the vendor company. The head office of the company was at Leeds, England, and Mr. C. E. Hope, of Vancouver, B.C., was local manager.

The following is an excerpt from the 1901 report of the directors of the New British Columbia Development Corporation: "This company holds the principal interest in the Emily Edith Mines, Ltd., and your directors regret that developments have not yet brought any return to the shareholders. A large amount of work has been done on the property under difficult circumstances, and the results are as yet undecided. The

Emily Edith Company reports that the long-looked-for vein has been cut in No. 4 tunnel, and it is hoped that the ore bodies in the upper levels will also be found to extend to this level."

The official reports for several years give scant information concerning this property, but that for 1904 includes the following notes by the Provincial Mineralogist: "The Emily Edith, another of the well-known groups of claims in this (Slocan Lake) district, formerly shipped considerable ore, but for the past two or three years has been shut down, and was found to be in the charge of a caretaker only, who was temporarily absent in Silverton when the property was visited, and, as all the tunnel entrances were locked up, nothing was seen of the underground workings.

"The country rock is a hard brown shale, and is cut by a strong north and south fissure vein, containing argentiferous galena and zinc blende. The mine is developed by a series of adit tunnels run in on the lead (to judge from the size of the dumps, for a considerable distance), and of these No. 4 is evidently the main or working tunnel. About 10 tons of galena ore, about 60 per cent. lead, was still in the ore-sheds, and there were various piles of zinc blende ore, estimated at about 500 tons of 30 per cent. zinc.

"The mine is equipped with good buildings, ore-sheds, stables, office, and a bunk-house well worthy of being copied by other mines in the province, in which a well-planned attempt was made to give the men reasonable comfort and chances for cleanliness. The bunk-house is a frame building, two and one-half storeys high, with basement, lathed and plastered inside and clap-boarded outside, and was not an expensive building to construct. In the basement is a heating furnace for the whole building. The first floor contains changing-room, wash-room, sitting-room, and writing-room for the men, with a separate entrance, office, draughting-room, and rooms for foreman and clerks. The top storey is one large, well-lighted and ventilated room, provided with a single row of double bunks, well built of planed lumber. This is the 'ram pasture,' where men are provided with a bunk and mattress without extra fee beyond the usual charge for board. The second floor is divided up into small rooms, each with a window and door, some fitted up with two beds, and others, larger, with four beds, each bed being provided with a woven-spring mattress, etc. Beds in these rooms could be had at a small additional charge, said to be 75 cents a month for a bed in a 4-bed room, and $1 a month in a 2-bed room. These charges, though small, paid splendid interest on the additional cost of construction, and the fact that they were always in demand proved that the men did not grudge the additional charge, which ensured them some privacy and a chance to keep clear of the dirty and undesirable element which, however small in proportion, is often to be found in a mine bunk-house. This bunk-house was planned and built by the then manager, Mr. E. Rammelmeyer."

The 1905 "Annual Report" contained the meagre information that "the Emily Edith is operated by Mr. M. S. Davys, under lease and bond, and it is reported that there is sufficient ore in sight now to pay for the mine." Apparently, though, that report was not well founded, for about this time, probably in the first half of 1906, it was stated that the Emily Edith was under lease to the Canadian Metal Company, which in that year made an attempt to smelt lead-zinc ores at Pilot Bay smeltery. However, the lease, if held by that company for a while, was allowed to lapse, for, in 1908, it is found, the property had passed to the possession of Messrs. John A. Finch and Geo. H. Aylard, owners of the adjoining Standard group, situated higher up the mountain-side. Since then, until early in 1911, only a very little work was done in one of the Emily Edith tunnels, and then for a while even that was stopped. Now the Standard Company has resumed work in the highest long adit tunnel, which is about 750 feet vertical depth below the lowest (No. 6) tunnel of the Standard mine.

As the Emily Edith may be expected to yet play an important part in connection with the further development of the property of the Standard Silver-Lead Mining Company, now one of the dividend-paying mines of the province, the following excerpts from a description, written by Mr. A. C. Garde, formerly manager of the Payne mine, for the Zinc Commission Report, 1908, will probably prove of interest and at the same time be useful for future reference as development in the lower levels of the amalgamated Standard-Emily Edith property shall be proceeded with.

"The Emily Edith mine is situated from 800 to 1,100 feet above Slocan Lake, and is three or four miles north of Silverton. It is reached over a good wagon road. The country rock in the immediate vicinity consists of shales and slates, and the Emily Edith lode impressed me as being a considerably crushed and widely mineralized ore zone in that formation. It shows much irregularity in its width, course, and dip. There are on the property, altogether, six adit tunnels, from which many drifts and cross-cuts extend in the direction of one or both of the walls. The total of work done is probably about 8,000 linear feet. I visited four of these tunnels and located the principal zinc ore-shoot of the mine in each of them, these representing a vertical depth of 173 feet, or about 250 feet, measured on the dip of the vein. The ore body is no doubt continuous for this distance, and of importance as a concentrating ore. Recently a mill test was made at the Wakefield concentrator on a 100-ton lot, and a representative sample of the zinc concentrate produced from the ore, was secured for experimental purposes.

"In the upper tunnel, No. 02, the ore body referred to above shows for a distance of 60 feet, averaging about two feet in width. In the next tunnel, No. 01, which is 57 feet below No. 02, the ore can be seen to better advantage, and measures in one place 6 feet in width. . . . The vein itself is of considerable width, and the pay-ore appears to lie on both walls, which are from 10 to 30 feet apart. . . . In tunnel No. 1, which is 53 feet vertically lower than No. 01, the same ore body can be observed immediately below its exposure in No. 01. . . . The ore-shoot has been exposed intermittently along the supposed footwall for 250 feet; also in a drift back of the supposed footwall for about 75 feet. The pay-ore in both drifts is from two to three feet wide, and fairly continuous. At one place along the level the ore body widens out to 6 feet 6 inches. . . . The next level, No. 2, is 63 feet vertically below No. 1, and exposes the ore-shoot for about 75 feet along the level. . . . . In a cross-cut the ore body shows a distinct width of 10 feet. This showing, however, has not been followed up, evidently because the original company was not developing the property for zinc. The galena associated with the ore could evidently not be mined and sorted at a profit, and would require concentration. . . . While there is no tonnage of ore actually blocked out in this proptrety, there

is undoubtedly a considerable quantity of concentrating ore to be relied on. I should estimate this roughly at 10,000 tons of ore, containing 22 per cent. zinc, 6 per cent. lead, and 6 ounces of silver to the ton. Systematic development is likely to increase this tonnage materially.

"In tunnels Nos. 3 and 4 there has been considerable drifting and cross-cutting done, but so far it has not proved successful in locating the above-mentioned ore body or any others. Tunnel No. 3 is entirely off the course, and must have been driven for other purposes than the one of showing up existing ore bodies."

The assay value of the samples taken by Mr. Garde have been omitted from the above excerpts, for the reason that development work in the lowest level of th Standard has proved the occurrence there of much ore of higher grade in silver and lead, and since it is expected that these ore-shoots will be found to continue downwards to the depth of some of the Emily Edith adits, those assays are not likely to prove fairly representative of what may be found in lower ground the Standard will open.

MACHINERY AND EQUIPMENT NOTES.

The Sullivan Machinery Company has put on the market a new rock drill—the "Lightweight." The "Lightweight," weight 155 pounds, can be readily set up and run by one man, and has larger capacity and greater drilling speed than the hammer type. The cylinder diameter is 2⅝ inches. It drills holes nine feet deep for 1½-inch powder. The length of feed is 24 inches. The drill requires 70.5 cubic feet of air at 70 pounds pressure, 92.5 feet at 85 pounds, and 110.5 feet at 100 pounds. It is designed to be mounted on a 3½-inch mining column, but the trunnion will fit any standard tripod or column. Among the new features embodied in the "Lightweight" are: Automatic lubrication, counterored cylinders rifle bar with five plates, steel collar under ratchet head, front cylinder head of drop forged steel, external and internal dowels, reversible shell, and new style malleable iron throttle valve.

BRITISH COLUMBIA COPPER COMPANY.

The preliminary figures for April's production of the British Columbia Copper Company are placed at between 860,000 and 875,000 pounds, and the earnings, based on the billed price of copper at $48,000. It is believed, when settlement is made for the months, that this last named figure will exceed $50,000. The April production and earnings both show a falling off from those of March when the former amounted to 1,043,173 pounds and the latter to $65,243.

The decrease shown in April was caused by a slide or cave in the ore at the Motherlode mines, which delayed production and interfered with the opration of

The Michigan College of Mines is to be congratulated on being the first among the mining schools of this continent to recognize that science graduates should be able to write a report in grammatical English. This important discovery has led to the establishment of a department of technical writing at the Michigan school, and a course in this subject will be included in the curriculum, commencing next year. Our Canadian mining schools might advantageously follow this excellent example.

PORTLAND CANAL MINING COMPANY.

Mr. W. J. Elmendorf in his report as manager states: There seems to be an opinion on the part of many that the mine is worked out and colour may have been given to this report by the cessation of operations and the failure to put the property on a profitable basis during the past year. The mine is by no means worked out. At the time we closed down it was producing 100 tons per day with about 30 men in the mine. The porphyry dyke is fairly well defined on the surface and future development in the mine can be away from it. Its extent and position are even better shown by the underground workings and, apparently, the faces of both No. 2 and No. 3 drifts are beyond it. Drifting to the south will probably disclose new ore and the completion of the Max raise to the surface at what is known as the Upper Open Cut will, in all probability, put more than 200 feet of ore in shape to stope. The fact of this raise is now in ore and there is eight feet in width of ore in the Upper Open Cut. I am as strongly of the opinion as ever that the mine is a good property and will be worked at a profit with further development. We have been unfortunate first, in the seemingly unwarrantable delay in the delivery of the machinery, and, second, in entering a low-grade ore zone at the time when it was, from every standpoint, most important to make a good showing."

After describing all the improvements on the property as of the best and in good order, Mr. Elmendorf continues: "Rather extensive exploratory work on the surface, done both by us and our neighbours, has demonstrated the existence of a main fissure zone, several hundred feet in width and perhaps five miles in length. Within this zone are included most of the ore deposits of the vicinity and more or less ore has been exposed on practically every claim through which it extends. As this zone is well defined where it crosses Glacier Creek at a point nearly 2,000 feet lower than our present workings, the question as to the advisability of developing the mine from that, or an even lower level suggested itself. This evolved the co-operation of several of the adjoining properties and steps have been taken to secure this with every promise of success. It now seems probable that the necessary financial assistance to properly carry on the enterprise will be forthcoming as soon as the weather conditions will permit of the careful examination of the surface and underground workings of the several mines.

With a larger basis of operations, extensive development of the vein, or veins, increased milling capacity and better facilities for mining, milling and transportation, it is reasonable to expect a successful outcome to this enterprise and ultimately a very large and profitable mine. All this depends, without doubt, upon the opening of large ore bodies of profitable grade, but I have yet to hear the first unfavourable opinion on this point from any competent engineer who is acquainted with the properties and many such, including the eminent men of the profession, have visited the mines."

A series of interesting experiments have been conducted recently at the University of Wisconsin to determine the effect of alloying iron with copper-nickel. The results, it is stated, indicate that the existing prejudice against the presence of copper in iron or steel is not warranted; and suggest a further utilization for monel metal in connection with steel making.

SPECIAL CORRESPONDENCE

ONTARIO

Cobalt, Gowganda and South Lorrain.—A development which will have marked effect upon the future possibilities of the Kerr Lake section has been carried out on the Crown Reserve within the past month. So far while the Crown Reserve has demonstrated unexpected wealth laterally above and at the 200-foot level, little addition has been made to the ore reserves by exploration in the keewatin or diabase below that point. Now a vein has opened up which appears to offer a very definite hope that exploration will be fruitful at depth in the Kerr Lake area. In the Silver Leaf shaft sunk by the Crown Reserve on the north shore of Kerr Lake a crosscut has been run towards the Crown Reserve line at the 500-foot level. Some weeks ago a vein a foot wide of calcite and quartz was cut showing a little native silver. To-day sixty feet of this vein has been opened up in Crown Reserve alone. The vein of quartz and calcite varies from six inches to two feet. In the centre of this gangue material is the pay streak four to six inches wide containing from a thousand to four thousand ounces in silver to the ton. Already seveneral tons of this ore have been raised. The rock is, or appears to be, altered diabase and the silver is associated with copper pyrites, galena and zinc blende. There is no trace of a vein on the surface. A crosscut is being run now to endeavour to pick up the same vein on the 200-foot level. The Silver Leaf from which the exploration work which has resulted in the discovery of the vein, was conducted, is under option to the Crown Reserve Mining Company, the contract taking effect from October 4th, 1909, for a period of five years, with option of renewal for another five years. The royalty for the first period is 25 per cent.; for the second 35 per cent. The Crown Reserve spent $20,000 on the property for the first year of the option and is disbursing $10,000 a year now and as long as the option lasts.

Exploration work on the La Rose has reached a very interesting stage. Crosscutting 380 feet below the surface and 280 feet from the top of the winze is in progress, and both faces are in good coarse conglomerate, and development on the Meyer vein of the Nipissing near the Keewatin contact gives hope of a successful conclusion to the hunt for further ore on the La Rose.

The Princess was, last month, the mainstay of the La Rose group, it producing $40,000 net, while the Lawson showed some falling off. The latter mine, with its short, but marvellously rich, ore shoots, produced over 2,000,000 ounces last year. The No. 9 vein has held out surprisingly well and many rich pockets have been developed on it.

At the Fisher Eplett, the South Coleman property of the La Rose Consolidated, two promising veins of calcite and quartz have been cut, one of which is a foot wide. As all the ore in this district occurs in lenses the probablility of running into similar rich ore shoots along the extension of these veins appears very favourable. Further development of the Violet by the La Rose has not led to any favourable re-valuation of the property which was worked in the very early days of the camp, but shut down long before the La Rose Consolidated acquired it. It is in the diabase adjoining the Silver Cliff and the Colonial.

Strong pressure is again being made to have the royalties on some of the Cobalt mines reduced, notably, the City of Cobalt, the Chambers-Ferland and the O'Brien. The City of Cobalt has ceased paying dividends for two years now and the Chambers-Ferland never has made a disbursement and it is felt that all the profit now being made goes to the government in royalties. The City of Cobalt pays 25 per cent. net to the T. & N. O. Commission, the Chambers-Ferland, 25 per cent. net to the Ontario Government and the O'Brien 25 per cent. gross to the Ontario Government.

Taking into consideration the awful condition of the road between Elk Lake and Gowganda, work proceeds with success in the Gowganda camp. In addition to the Millerett and the Miller Lake-O'Brien- which have been regular producers for some time now, the Mann can now be definitely classed as a mine. A good ore shoot has been opened up at the 100-foot level. This company has also taken over the Boyd-Gordon and is now pushing a drift in ore to the line. The head of the drift is now within thirty feet of the line. The South Bay Mining Company, which has taken over the O'Brien-Jacques claim, has also obtained control of the Remey properties and is doing considerable development work.

At Hangingstone Lake the Temiskaming and Hudsons Bay Company has recently cut two good veins in the drift. This company now has a good plant installed and is working steadily. All supplies for the camp still go in by Latchford and up the Montreal River to Elk Lake. The right of way on the T. & N. O. branch from Earlton has been cleared and grading is in progress all along the line. The line will cross the Montreal River near the old Hitchcock property and run up the west shore of Elk Lake to the settlement.

Last month the McKinley-Darragh produced 306.000 ounces. The management believes that the production this year will amount to over 3,000,000 ounces, as it can now be stated with considerable confidence that the production for the first six months will reach 1,500,000 ounces. This will be a considerable increase as total ounces last year amounted to 2,640,177 only.

The increased production may be attributed to two new veins that have been discovered under the swamp this year. The Savage is also making new records.

The Coniagas is now making preparations to open up the southern end of their property. To attain this end a crosscut is being run from the 225-foot level under the centre of the town to a point below the corner of the Hunter block. A raise will be put through to connect with the old shaft sunk some years ago at the corner of Silver street and Prospect avenue, but which has never been used so far.

As a result of the annual meeting of the Peterson Lake Mining Company, the present directorate, headed by Sir Henry Pellatt is more firmly established than ever. The balance sheet showed that there was $44,022 cash in the bank at the end of the year. The operating account for the year showed a loss of $1,463, total receipts being $8,757 and expenses $10.220. All the leases were cancelled with the exception of the Kerry now worked by the Seneca Superior Company and the Gould. The plant of the Little Nipissing Company was purchased for $2,400, and the company is now developing that lease itself.

Porcupine and Swastika.—Concurrently with the formation of the Canada Mining and Development Company many exploration parties have left by way

of Cochrane for the discovery of mineral in or near the east coast of Hudsons Bay. The new company is by far the best equipped so far for the examination and exploitation of properties in the initial stages and they already have some of the best prospectors in the North country in the field. Sir William Mackenzie who is in the new company has had a man in the Hudsons Bay field for almost two years now. It is probably this region that will receive first attention by the new company.

Two other expeditions have started during the past month, both heading for the East Main River as the base of their operations. The Donaldson party financed by a Montreal syndicate has taken up seventeen men, two gasoline boats and eight tons of provisions. They will stay in the country four months. Some of the men will be left on Clark's Island to develop an iron deposit which has already been staked by a member of the syndicate, and the remainder will be split up in two or three parties proceeding up the East Main River. Their objective is placer gold.

J. D. Grant, who has been mainly responsible for the many stories of diamond finds on Hudsons Bay has also taken in a small party. They are going in by the Nottaway River to Ruperts House and so to East Main River. A visiting South African who was shown some of the stones which were said to have come from Hudsons May declares that they are not diamonds at all, but white sapphires, and so of not any great commercial value.

The troubles which have attended the operations at the Dome mill ever since stamps commenced to drop at the latter end of March, now appear to be over. The one source of trouble has been the tube mills. These cylinders went through the heat of the July fire, and when they came to be tested out the "heads" on three of them broke repeatedly. Production was cut down by more than one half. Now all the forty stamps are dropping and three of the tube mills are in commission and from 200 to 300 tons per day are being treated.

The staff at the McIntyre Porcupine mine has been very materially reduced, the management feeling the necessity of economizing. Mr. F. P. Swindler, who has for the past two or three months been in charge of operations has left the camp with W. Cooper, who has been in charge of underground operations. The mine will now be operated by C. B. Flynn. The object of the reduction is to make the mine self-supporting, the little ten stamp mill to provide running expenses until such time as the larger mill is completed.

The Pearl Lake Mining Company has resumed operations under the charge of Col. Stevenson, the representative of a syndicate of Pennsylvania railroad officials, who have become interested in the Porcupine district. The shaft at the Pearl Lake is to be sunk directly to the 800-foot level while at the same time the crosscut which had already been commenced at the 400-foot level to find the ore body is continued. The syndicate is to spend $250,000 on the property under the terms of the agreement and is going conservatively to work.

The Vipond mill will be running before this appears in print. The machinery has all been installed with the exception of one ten horse power motor which has lost en route. The mill can be started up twenty-four hours after this piece of machinery arrives.

Under the direction of Mr. W. Janitsch, the position at the Standard appears more hopeful. In the drift at the 100 foot level another rich ore shoot has been encountered in a crosscut opened up from the main vein. An adequate plant is now being installed on the property.

At the Moneta a body of quartz some fifteen feet wide has been crosscut at the 180-foot level but so far values have been so low as not to warrant the hope that it would make pay ore. A contract has now been let to diamond drill from the drift.

NOVA SCOTIA

Port Hood Commission of Enquiry.—The Government of Nova Scotia during the Easter Session appointed the Deputy Commissioner of Mines, and Messrs. McEachern and McKenzie, of the Dominion Coal Company's staff, as a Commission of Enquiry into the flooding of the Port Hood Colliery. These gentlemen spent the week ending the 1st of June on the ground at Port Hood.

A New Rescue Car.—The Nova Scotia Steel & Coal have recently equipped a rescue car to serve their collieries, which possesses many novel features. It is designated somewhat on the lines of the rescue cars of the United States Mines Bureau, but has unique improvements. The car is fitted at one end with hose and reel, and other fire-fighting appliances, and the end of the car will drop so as to form a platform on which to run out the hose reel. In another section of the car are 12 Draeger apparatus, complete with oxygen refill pump, oxygen reserve. Electric hand lamps are provided, together with a charging station for the accumulators of the lamps. Sleeping accommodation and blankets are provided for the rescue teams, and the car is provisioned. A full equipment of surgical bandages, splints, antiseptics and restoratives is also provided. The car is fitted with a portable telephone attachment, and it can be connected with the nearest telephone circuit immediately. A system of fire whistles has been arranged, and the locomotive driver nearest to the car has instructions to attach his engine upon hearing the alarm in readiness to convey it to the required place.

Dominion Coal Outputs.—The Coal Company again exceeded all previous production figures in the month of May, the output from the Glace Bay mines totalling 388,536 tons. This is the largest tonnage yet hoisted in any one month, the highest previous production being 387,927 tons in August, 1911. The figures for the individual collieries were approximately as under:

	Tons.
No. 1	52,204
2	73,770
3	12,014
4	37,486
5	24,658
6	26,332
7	16,558
8	13,709
9	37,386
10	18,190
12	27,752
14	25,969
15	9,021
16	9,773
21	2,113
22	1,601
	388,536

New records were established by No. 2 Colliery and by No. 12 Colliery, and Nos. 15 and 16 Collieries appear as fairly large producers. Both these mines are now averaging an output of 500 tons daily. During the four closing days of the month, i.e., from the 29th to the 31st inclusive, the output totalled 67,357 tons, or an average of 16,600 tons per day.

The output for the first five months of the year compares with previous years as follows:

	Tons.
5 months ending May 31st, 1908...	1,585,364
5 months ending May 31st, 1909...	1,273,676
5 months ending May 31st, 1910...	1,196,919
5 months ending May 31st, 1911...	1,524,539
5 months ending May 31st, 1912...	1,732,610

The increase for the five months over the corresponding period of last year amounts to 208,000 tons, and is almost 150,000 tons greater than the figures of 1908, which up to the present time were not equalled.

The Springhill collieries produced during May 37,800 tons, making a total for the five months ending May of 180,800 tons, an increase over 1911 figures of nearly 130,000 tons.

The combined increase in the output of the Glace Bay mines and the Springhill mines over 1911 tonnages amounts to over 336,000 tons to the end of May.

Notwithstanding the large output actually obtained, the production should have been much greater, and would be, but for the excessive amount of time lost by the workmen after the mid-monthly pay-day. The "blind pig" is an institution often referred to in connection with the mining camps of the Cobalt and the Porcupine, and the mining companies of Cape Breton know to their sorrow that the species is to be met with in Cape Breton also. Eventually perhaps the well-meaning legislators who enact our laws may come to recognize that it is better to have a properly regulated and legitimatized liquor traffic, rather than the illicit sale and manufacture of the appalling mixtures which the miners of Cape Breton are compelled to drink should they wish to indulge in a "nip." Every little while criticisms are heard of the alleged lawlessness of European immigrants to the mining districts and the community is shocked by some murder or stabbing affray. In almost every case these troubles are traceable to liquor, to bad liquor, and the flask habit. Is it to be wondered at that the European immigrant, newly arrived in this country, with vague and grotesque notions of its wildness and dangers, should fail to appreciate the majesty of the law, when he begins to appreciate the Gilbertian situation which exists in Cape Breton where the sale of liquor is concerned? He comes from a country where the sale of liquor is legal and conducted under certain restrictions which no one dreams of attempting to violate openly. When he arrives in Cape Breton he finds that the sale of liquor is illegal, that its transportation is illegal and that the statutes are full of prohibitions connected with liquor and its sale. Nevertheless, it is an open secret that liquor is sold and sold in large quantities. The man who all his life has been accustomed to drinking his innocent lager in public and among his friends, is driven to partaking of the vilest and most maddening concoctions in a secret dive, which he probably will leave with a flask of the same mixture in his pocket, often ending up with a tragedy. Yet the smug public conscience says: "But the sale of liquor is against the law." So far in Cape Breton prohibition has not prohibited, and has merely succeeded in making an outlaw of a traffic which surely of all traffics needs proper legal regulation. When a traffic is illegal it is impossible of regulation, because the law cannot recognize its existence at all. Would it not be far better for all concerned to recognize the danger to our most cherished institutions and to all constituted authority which is fostered by this false position? Better by far to face the wild beast and shackle him, than to shut one's eyes and say the beast does not exist because he has been declared extinct by act of parliament. Oh, the pathetic faith of some people in an act of parliament!

BRITISH COLUMBIA

The following review and forecast of mining operations and mineral production in British Columbia in 1912, has been prepared by Mr. E. Jacobs, of Victoria.

"The outlook for mining in British Columbia for the current year is more promising than has been the case at the corresponding period of any of several recent years, as the following summary will indicate:

"Hydraulicking operations for the recovery of placer gold give promise of being larger on the whole than for some years, for, in addition to those in Atlin division of Cassiar district and Cariboo division of Cariboo district, there are those of the Quesnelle Hydraulic Gold Mining Company in Quesnel division, Cariboo, which company has not heretofore been a producer of gold.

"Lode gold mining has had the addition of the operations of the Motherlode Sheep Creek Mining Company, which commenced crushing early in May; beside which the Hedley Gold Mining Company may be expected to considerably increase its output this year, its tonnage for the first three months of the year having shown an increase of fully 35 per cent.—16,974 tons this year, as compared with 12,559 tons to April 1, 1911—and an almost proportionate increase in net profit, the average of which, in 1911, was $5.34 per ton of ore milled.

"Silver and lead, also, will probably show an appreciably large increase, for the Sullivan mine, in East Kootenay, promises to in considerable measure compensate for the loss of output of lead caused by the closing of the St. Eugene mine, while in Ainsworth division, the Blue Bell and some smaller mines also non-productive in 1911, are on this year's list of producers, and the Slocan will have the Rambler-Cariboo, Rio, Slocan Star, Standard, and several others, to increase its production of both silver and lead.

"Then, the larger copper mines,—namely, Granby, British Columbia, Copper, and Britannia,—are expected to make an enlarged output of copper, and will also add their quota of silver and gold, which is associated with copper in the mines of the first and second of these, and in smaller degree in the last-mentioned. The Centre Star group and Le Roi No. 2, in Rossland camp, are well maintaining their production of gold-copper ores; indeed the former ,now that the Le Roi has been added to it, is gradually increasing its output. In the Coast district, the Marble Bay mine, owned by the Tacoma Steel Company, and situated on Texada island, is the only noticeable producer in addition to the Britannia; its ore yields gold, silver, and copper, and its production continues to be satisfactory.

"Zinc is the only other metal produced in commercial quantity in the province. The provision of railway transportation facilities for the Lucky Jim mine, which has been without them since July, 1910, will allow of

shipment of crude zinc ore from that property as soon as the branch line from Three Forks, on the Canadian Pacific Railway Company's Nakusp to Sandon railway shall be completed—probably during the ensuing summer. There may not be much, if any, silver-zinc concentrate shipped this year from the concentrating plants near Sandon, Slocan, though both the Ruth and Slocan Star mills are equipped for making a zinc as well as a silver-lead concentrate, but it is not at present known to the writer whether or not these will be operated this year. Production of silver-zinc concentrate has been in progress at the Van-Roi Mining Company's mill on Four-mile creek, near Silverton, Slocan Lake, and it may be that the Standard mill at Silverton will also shortly be in a position to ship a zinc as well as a silver-lead product.

"Of course, there are other metalliferous mines than those mentioned above that will contribute considerably to the sum total of production of mineral. For instance, the Arlington, Granite-Poorman, and Queen, all in Nelson mining division, have for years been among the steady producers of lode gold, while the Emerald, in the same division, has shipped much lead and the Molly Gibson silver-lead ore. Then, in Ainsworth division, No. 1, Highland, Utica, Whitewater of Retallack Co's group, and several smaller shippers, may be expected to do their share in making up a goodly total production this year. In Slocan the Reco, Noble Five, Richmond-Eureka, Hewitt-Lorna Doone, and Eastmont, beside probably a score of smaller producers, will also be on the year's list of shippers. Then there will be some ore from the Silver Cup mines, in Lardeau, and from the Blue Bird and, possiblly, several other Rossland South Belt properties; while there is likely to be a resumption of shipping in a small way from claims up the West Fork of Kettle River. Still others will produce ore, for the before-mentioned properties by no means exhaust the list, yet enough have been named to support the statement that the outlook is generally promising for an enlarged production of mealliferous minerals.

"Turning to coal, there seems good reason for concluding that prospects are much improved, for working conditions are normal in the Crow's Nest district, South-east Kootenay; the Princeton colliery is better equipped for handling coal than in past years; the Nicola Valley Coal and Coke Company's production should show further increase and two or three of the smaller coal mines in Nicola Valley be in a position to make production in larger degree than last year, while on Vancouver Island the number of mines from which coal is being extracted and the quantity available for mining, together suggest a record output for 1912.

"The demand for coke should be larger this year than last, for, with copper at a higher average price, as has been the case over the five expired months of the year, several smelteries of the interior may be expected to be operated at about full treatmnt capacity —at any rate those at Grand Forks and Greenwood, if not at Trail, which last may not find its supply of copper ores equal to the requirements of all its copper furnaces.

"Last, as to building materials, etc.: Statistics for the production of building stone, rock used in road and footpath construction, cement, lime, and clay products, make it evident that in late years the estimates for building materials have been less than the actual value of the output. Building and other construction work is proceeding at such a rate that a total value for 1912 of about $4,000,000 seems quite a reasonable estimate, for the demand for materials of these kinds in the larger cities of the coast, and in smaller degree in the interior, is increasingly active, while other construction work is also requiring much material.

"Altogether, then, conditions would appear to make a liberal estimate of the value of the current year's mineral production well warranted. Of course, it must be conceded that the approximate estimate outlined below cannot be realized if there shall happen any serious interruption to output or a decrease in average prices below what now prevail. Assuming, then, that neither contingency will arise to prevent promise being realized, the following rough guess at the value of the several classes of mineral may be ventured upon:

Appropriate Estimate of Mineral Production in 1912.

Mineral.		Value.
Gold, placer		$ 700,000
Gold, lode		6,000,000
Total gold		$ 6,700,000
Silver		1,500,000
Lead		1,500,000
Copper		6,500,000
Zinc		300,000
Total metalliferous		$16,500,000
Coal	$10,000,000	
Coke	1,200,000	
Total	$11,200,000	
Building materials, etc	3,800,000	
Total non-metalliferous	15,000,000	
Estimated total value		$31,500,000

"If this estimate shall be realized, the value of the year's mineral production will be $8,000,000 higher than that of 1911, and $5,123,000 higher than that of 1910, which latter was the highest in the history of mining in the province, and it will bring the aggregate value of production in all years on record up to more than $429,000,000.

"Knowing how risky it is to make a forecast thus early in the year, I must again mention that the estimate has been made on the assumption that present promise as to both amount of production and average prices throughout the year, will be well maintained, for, if either or both of these shall not be, then the value of the year's production will be proportionately less."

RAND OUTPUTS.

The gold output for April of the mines on the Witwatersrand amounted to 706,763 ounces of fine gold, and from the outside districts 30,897 fine ounces, total 737,660 ounces, valued at £3,133,383, as against 830,723 ounces, valued at £3,528,688, in March. This is a decrease of 93,063 ounces, or £395,305, on the month, but it will be remembered that the March total included 70,143 bullion reserves extinguished, while, moreover, April was, of course, only a thirty days' month. The daily average for April was 24,589 ounces, against 24,535 ounces (excluding the bullion reserves extinguished) for the previous month, and thus constitutes a record.

STATISTICS AND RETURNS

B. C. ORE SHIPMENTS.

May 24.—With last week's shipments the ore production of the Kootenay and Boundary district for the year to date topped the nine hundred thousand-ton mark and from now onwards this total, which is considerably higher than that for the same period last year, is certain to gain at a rapid rate over the figures for 1911 for the reason that the Molly Gibson mill and the Mother Lode mill are commencing operations, the Silver Hoard mine at Ainsworth and several other properties in that camp are expected to be on the producing list early next month and increases are looked for in the production of the Slocan mines.

Last year the week ending May 26 saw the last production of the Granby mines for some five months on account of the Crow's Nest coal strike.

Three Mines Show Heavy Gain.

Three mines which this year have contributed most heavily to the increased ore production are the Granby, the Mother Lode at Greenwood of the British Columbia Copper Company and the Le Roi at Rossland. To this date last year the Granby had produced 458,982 tons, compared with 489,339 this year; the Mother Lode 138,049, against 154,452 this year, and the Le Roi 5,099 tons, compared with 19,282 this year.

The big Mother Lode mill at Sheep Creek is expected to be in operation within the next week or ten days. A 24 hours' trial run was made with satisfactory gold output, but a minor mishap to some machinery caused a breakdown which necessitated some delay in resuming operations.

The Standard mine, the big Silverton dividend payer, is keeping up its heavy shipments, sending 183 tons to Trail smelter last week.

For the week the ore production was 47,250 tons; for the year to date 903,026 tons. The smelter receipts for the week were 44,791 tons; for the year 857,190 tons. The shipment from the Silver King is from a clean-up at the Hall mines smelter. In detail the figures are:

East Kootenay.

Sullivan	850	11,728
Monarch, milled	200	3,800
Other mines	...	1,028
Total	1,050	16,650

Nelson.

Arlington	29	699
Queen	39	149
Molly Gibson	104	931
Silver King	20	20
Granite-Poorman, milled	250	5,500
Queen, milled	300	4,800
Molly Gibson, milled	300	600
Other mines	...	2,798
Total	1,042	15,497

Slocan and Ainsworth.

Standard	183	13,501
Van-Roi	92	1,418
Rambler-Cariboo	24	521
Standard, milled	300	6,000
Van-Roi, milled	800	16,500
Other mines	...	6,182
Total	1,399	34,122

Rossland.

Centre Star	3,745	62,384
Le Roi No. 2	516	11,701
Le Roi	889	19,282
Le Roi No. 2, milled	300	6,100
Other mines	...	69
Total	5,450	99,536

Boundary.

United Copper	38	73
Granby	25,218	489,339
Mother Lode	6,808	154,452
Unnamed	392	3,890
Rawhide	5,699	75,731
Jackpot	154	7,066
Other mines	...	6,664
Total	38,309	737,215

Granby Smelter Receipts.

Granby smelter receipts, Grand Forks, B.C.:

Granby	25,218	489,339

B. C. Copper Co. Receipts.

British Columbia Copper Company's receipts, Greenwood, B.C.:

Mother Lode	6,808	154.452
Unnamed	392	3,890
Rawhide	5,699	75,731
Jackpot	154	7,066
Other mines	...	5,003
Total	13,053	246,142

Trail Smelter Receipts.

Consolidated Company's smelter receipts, Trail, B.C.:

Sullivan	850	11,728
United Copper	38	73
Le Roi No. 2	516	11,701
Le Roi	889	19,282
Centre Star	3,745	62,384
Rambler-Cariboo	24	521
Van-Roi	92	1,418
Standard	183	13,501
Silver King	20	20
Molly Gibson	104	931
Queen	39	149
Arlington	29	699
Other mines	...	9,301
Total	6,520	121,709

COBALT ORE SHIPMENTS.

The ore shipments of the week amounted to 12 cars, all of which, with the exception of two cars sent from the Nipissing, were of high-grade ore. The Coniagas headed the list with three cars, and the Temiskaming appeared this week as an ore shipper, while it also sent out a consignment of bullion. The Chambers-Ferland made another of its infrequent appearances in the list of shippers, and the Buffalo also sent out a car of concentrates.

The shipments for the week and year, in tons, to date are as follows:

	Week June 7.	Total.
La Rose	32.29	1,491.55
Coniagas	76.32	889.82
O'Brien	....	263.24
Right of Way	....	148.60
Chambers-Ferland	32.00	225.60
McKinley-Darragh	68.64	1,209.00
Nipissing	76.10	901.28
Hudson Bay	....	312.62
Buffalo	32.80	475.52
Crown Reserve	....	210.26
Cobalt Townsite	....	536.78
City of Cobalt	....	14.84
Trethewey	33.65	241.04
Colonial	....	41.60
Kerr Lake	....	319.66
Cobalt Lake	....	207.41
Drummond	....	318.77
Temiskaming	32.00	416.87
Beaver	....	187.80
Wettlaufer	....	11.21
Provincial	....	22.22
Casey Cobalt	....	24.50
Totals	389.71	8.577.77

Only two mines appeared amongst the bullion-shippers of the week, these being Nipissing and the Temiskaming. Campbell & Deyell sent out the shipment of bullion from Temiskaming ore. The shipments for the week were as follows:

	Ounces.	Value.
Nipissing	73,378	$46,092.34
Temiskaming	2,331	1,421.91
Totals	75,709	$47,514.25

The bullion shipments for the year to date are as follows:

	Ounces.	Value.
Nipissing	1,661,141.75	$966,984.52
Crown Reserve	207,203.00	115,951.19
Temiskaming	2,331.00	1,421.91
O'Brien	88,433.01	50,964.00
Nova Scotia	49,010.00	31,800.00
Buffalo	38,938.00	22,714.54
McKinley-Darragh	10,327.00	6,069.37
Kerr Lake	7,240.25	4,381.21
Trethewey	5,703.60	3,238.00
City of Cobalt	1,618.40	1,000.00
Colonial	1,698.00	1,018.00
Miscellaneous	10,268.81	10,798.64
Totals	2,146,778.88	$1,250,146.34

EL ORO (MEXICO) FOR APRIL.

The following despatch by cable to London gives El Oro April returns:—

"Mill ran 26 days; crushed 17,810 tons of ore; tailings retreated, 15,270 tons; producing a total of U.S. $169,340; less working expenses U.S. $90,510; development expenses U.S. $24,740—U.S. $54,090. Profit from the railway for the month, U.S. $8,420—U.S. $62,510, or £12,502, less estimated monthly expenses, London and manager's salary, £700—£11,802. The sum of U.S. $950 was expended during the month on permanent improvements (not included in the above expenses)."—(March profit, £11,722.)

ECONOMIES AT THE GOLDEN HORSESHOE MINE.

By the installation of new stamps, tube mills and concentrating tables and sand vats, treatment costs have been reduced at the Golden Horseshoe mine at Kalgoorlie. In his report for last year, recently issued, Mr. J. W. Sutherland, the general manager, states that the treatment cost for 1911 was 10s. 0.27d. per ton, and he adds that "on last year's tonnage this shows a saving of £28,798; of this total £14,021 represents economy in power and £14,777 is on account of the greater efficiency of the treatment plant." Apart from the great economy effected, the installation of new plant was necessary, as without it the tonnage treated and the development work would have had to be considerably curtailed; besides this, the company has the necessary margin of power and plant available to treat the further expected increase in tonnage raised, it having been found that the tube mills allow of crushing with a much coarser screen than was anticipated, thus increasing the capacity of the plant. The extraction last year at this mine was 85.53 per cent., excluding the gold from the re-treatment of tailings.

SAND TREATMENT AT THE WAIHI GRAND JUNCTION.

At the Waihi Grand Junction Mine (New Zealand) the treatment of the sand by merely washing it by percolation has given such satisfactory results that two more hydraulic sizing cones are being installed, so that the whole of the sand produced can be separated and similarly treated. The percolation treatment is stated to cost 4d. per ton less than agitation and vacuum filtering, and there is an additional gain inasmuch as the vacuum filters are relieved of the filtering of the sand, and are thus free to deal with an increased tonnage of slime. The fineness of the sand averaged:—

Retained on 100 mesh..... 8.3 per cent.
Retained on 150 mesh..... 28.4 per cent.
Retained on 200 mesh..... 27.5 per cent.
Passed through 200 mesh..... 35.8 per cent.

and the battery superintendent states that percolation through it has been remarkably fast and even, the washing being almost perfect.

QUEENSLAND GOLD RETURNS.

The following are the April gold returns of Queensland:—

	Tons crushed.	Yield in ozs.	From Copper ores, ozs.
Charters Towers	11,600	9,100	100
Croydon	1,000	1,200	...
Gympie	11,300	3,100	...
Mount Morgan	7,200	3,600	8,100
Ravenswood	4,100	2,800	...
Other sources*	3,700	1,000	1,500

* Alluvial 200 ounces.

Total yield in ounces, 30,700. Dividends, Croydon, £1,200; Gympie, £1,000.

The following cable was sent to London, Eng., on May 14th:—

Casey Cobalt—Cable:—"Total length drift vein 6, approximately 220 feet, ore chute approximately 180 feet; average width is 4 inches; average value, approximately 6,000 ounces; ore bagged, 34 tons."

TORONTO MARKETS.

June 11.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 6.50 cents per lb.
Lead, 5 cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 50 cents per lb.
Copper, casting, 17¾ cents per lb.
Electrolytic, 17½ cents per lb.
Ingot Brass, 7 to 12 cents per lb.
June 11.—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto)—
Summerlee No. 2, $23.50 (f.o.b. Toronto.)
Midland No. 1, $19.75 to $20.50 (f.o.b. Toronto.)
Midland No. 2, $19.75 to $20.50 (f.o.b. Toronto.)

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

June 7.—Connellsville coke—(f.o.b. ovens.)
Furnace coke, prompt, $2.20 to $2.30 per ton.
Foundry coke, prompt, $2.35 to $2.50 per ton.
June 7.—Tin, Straits, 47.50 cents.
Copper, Prime Lake, 17.50 cents.
Electrolytic, Copper, 17.25 cents.
Copper Wire, 18.25 cents.
Lead, 4.20 cents.
Spelter, 7.00 cents.
Sheet zinc (f.o.b. smelter), 8.65 cents.
Antimony, Cockson's, 8.00 cents.
Aluminium, 21.00 to 22.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $45.50 per ounce.
Platinum, hard, $47.00 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $41.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
May 22	61⅛	28⅛
May 23	61	28 1/16
May 24	60¾	28
May 25	61⅛	28⅛
May 27	61	Holiday
May 28	61	28⅛
May 29	61	28 1/16
May 30	..	28⅛
May 31	61	28 1/16
June 1	60⅞	28
June 3	60¾	27 15/16
June 4	60⅞	28 1/16
June 5	60⅞	28
June 6	60⅞	28

SHARE MARKET

(Courtesy of J. P. Bicknell and Company, Standard Bank Building).

June 5, 1912.

New York Curb.

	Bid.	Ask.
Braden	.07⅛	.07¼
B. C. Copper	.05⅞	.06
Giroux	.05⅝	.05¾
Greene Cananea	.10⅛	.10½
Inspiration	19.25	19.50
Yukon Gold	.03⅜	.03½
Goldfield Con.	4.37½	4.50
Nevada Con.	22.75	23.00
Miami	26.75	27.00
Ray Con.	20.00	20.12½
Chino	33.62½	33.87½
United Copper	¾	1.00

Cobalt Stocks.

	Bid.	Ask.
Bailey	.02⅛	.02¾
Beaver Con.	.44½	.46
Buffalo	1.30	1.55
Chambers-Ferland	.17	.18½
City of Cobalt	.15	.17
Cobalt Lake	.24	.25
Coniagas	7.00	.....
Crown Reserve	3.00	3.25
Great Northern	.07½	.08
Gould Con.	.02⅛	.03
Gifford	.02	.03½
Green Meehan	.01¼	.01⅝
Hargraves	.05	.06
Kerr Lake	2.80	2.90
La Rose	3.30	3.70
McKinley-Darragh	1.74	1.80
Nipissing	7.75	8.00
Ophir	.09	.02
Otisse	.01⅜	.02
Peterson Lake	.06¼	.07
Right of Way	.09	.10
Silver Leaf	.04	.05½
Silver Queen	.02	.04
Temiskaming	.41	.12
Trethewey, ex div.	.45	.49
Wettlaufer	.57	.60

Porcupine Stocks.

	Bid.	Ask.
Apex	.03	.04¼
Dobie	.30	.50
Crown Charter	.14¼	.14¾
Dome Extension	.32½	.33
Eldorado	.03	.06
Foley-O'Brien	.19	.22
Hollinger	10.60	10.80
Jupiter	.29	.30
Moneta	.08	.10
Nor. Ontario Exp.	2.00	3.00
North Dome	.25	.....
Pearl Lake	.20	.22
Porc. Imperial	.02	.03
Porc. Tisdale	.02	.02¾
Preston East Dome	.04¼	.05
Rea Mines	.30	.37
Standard	.02¾	.03¼
Swastika	.14½	.15¼
Vipond	.37	.39

West Dome	.17	.25
United	.01½	.02½

Sundry.

	Bid.	Ask.
Island Smelters	.03	.04
Can. Marconi	5.25	6.00
Amer. Marconi	9.25	9.50

According to the revised statistics of the Mines Branch for 1910, the following figures represent the gypsum production of Canada:

	Tons.	Value.
Nova Scotia	400,455	$458,638
New Brunswick	90,236	213,579
Ontario	15,055	67,229
Manitoba	19,500	195,000
Total	525,246	

The method of valuing evidently varies. In the case of Nova Scotia the gypsum is appraised as crude. Imports of crude were valued in 1910 at $12,137; ground at $17,402; and plaster of Paris at $123,965. Crude is duty free into Canada; ground carries at duty of 15 per cent.; and plaster of Paris a duty of 12½ cents per hundredweight.

The following cable was sent to London, Eng., early in May.—

Cobalt Town Site Silver—Mining results for week ended 11th May:—"Value of production, £3,518; operating expenses, £1,270; weekly profit, £2,248. Tons to mill, 580; enhanced expenses principally heavy mill tonnage. Canadian directors declared special bonus 5 per cent. payable with regular quarterly dividend August next."

The Guggenheim interests have sent an automobile up to Dawson, Yukon territory, to be used in connection with their mines in that distant part of Canada.

THE ANALYSIS OF TIN ORES.

The ore is roasted, extracted with hydrochloric acid, and the residue melted in a Hessian crucible with potassium cyanide. The heating is continued for a short time at a low temperature. The regulus is weighed, dissolved in hydrochloric acid, the tin precipitated with aluminium, and then dissolved in hydrochloric acid in an atmosphere of carbon dioxide. The solution is then titrated with ferric chloride solution, using potassium iodide and starch as an indicator.

The complete British Columbia plant is again in commission and operating entirely satisfactorily. From May 1st to May 15th inclusive, production amounted to 300 tons of copper which, if maintained, would indicate an output of 1,240,000 pounds for the month,—a record production for the company.

The mica industry of India gives employment to about 14,000 people. The wages paid are from 4 to 20 cents per day. The employees pay for their own board and lodging. The total annual output is valued at about $275,000. Very little machinery is used.

NOVA SCOTIA STEEL AND COAL.

The Nova Scotia Steel and Coal Company's annual report, considering the depression which has prevailed in the steel trade during the past year as a result of the chaotic business conditions in the United States is much more favourable than was generally looked for. Profits for 1911 amount to $1,019,393.51. With the exception of the year 1910 the figures are the largest in the company's history, exceeding those of 1909, which was a record year, by $112,000. That a new record was not established was due to the exceedingly poor prices which have prevailed, every department of the company's operations, excepting coal mining, having shown the largest outputs yet secured.

While no change is made in the six per cent. dividend on the common stock, the various accounts are placed in a much stronger position.

During the year, $1,101,145.31 has been expended on capital account at the company's various plants. The property and mines account has been reduced $100,000 by the sale of the Ferrona Railway.

Following out its policy of building up strong reserves, there has been added to the general reserve fund, in addition to the sinking fund payment the sum of $96,124.25, nearly $20,000 more than the previous year. The fire insurance fund has also been materially increased.

After making ample provision for depreciation by writing off $73,880 for betterment and improvements to plants, the balance of $508,544.81 is carried forward, a slight increase over that of 1910.

Of the submarine iron ore areas at Wabana, the directors report that the past year's experience has confirmed and strengthened their views as to the extent and value of this property.

Brief mention is made in the report of the successful sale of $1,040,000 worth of the company's bonds a few weeks ago, which has put its finances in good shape.

NIPISSING DIVIDENDS

The dividend record of the Nipissing now reads as follows:

1906	6	2½	$480,000
1907	12	2	840,000
1908	12	.	720,000
1909	16	6½	1,350,000
1910	20	15	2,100,000
1911—Jan. 20	5	2½	450,000
April 20	5	2½	450,000
July 20	5	2½	450,000
Oct. 20	5	2½	450,000
	91	38	$7,740,000
1912—Jan. 20	5	2½	450,000

The production of china clay in the Province of Quebec may prove the basis of a flourishing industry. An article in the next issue of the Canadian Mining Journal will describe the Quebec operations fully. Nearly every other important feature of growth in the exploitation of Quebec's minerals will be touched upon by special contributors.

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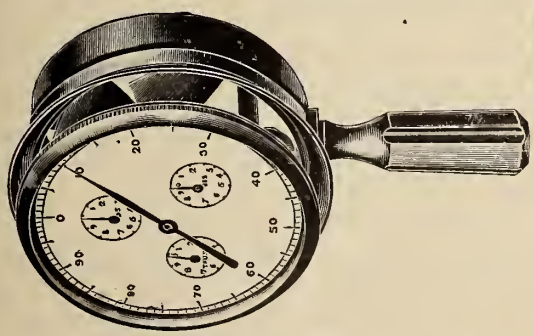

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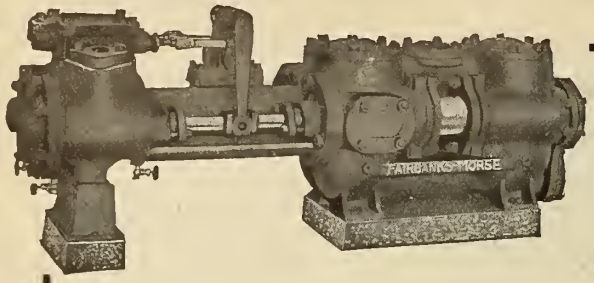

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Aggregate Value of $374,197,650

In 1910 the quantity of Ore mined was 2,216,428 tons, and of coal 3,139,235 long tons. The value of Minerals produced that year was: Placer Gold $540,000; Lode Gold, $5,533,386; Silver, $1,245,016; Lead, $1,386,350; Copper, $4,871,512; Coal and Coke, $11,108,335; Other Minerals, $1,692,473, making the

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Lode-mining has only been in progress for about eighteen years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

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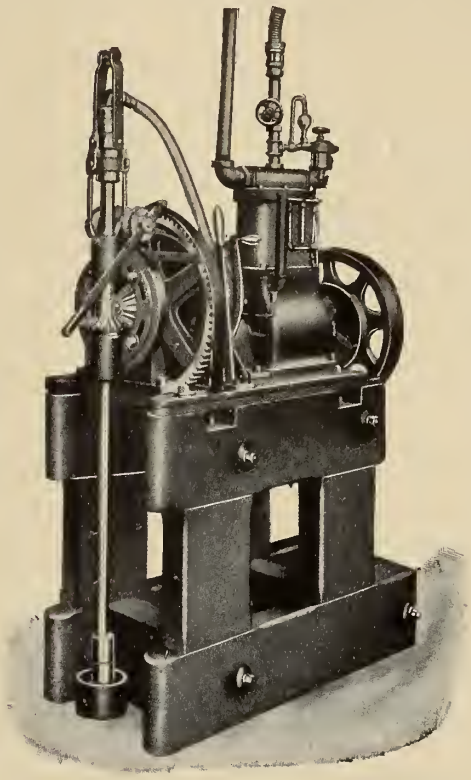

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Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

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The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

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Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals, extending northward from the great lakes and westward from the Ottawa River to the Manitoba boundary.

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In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

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For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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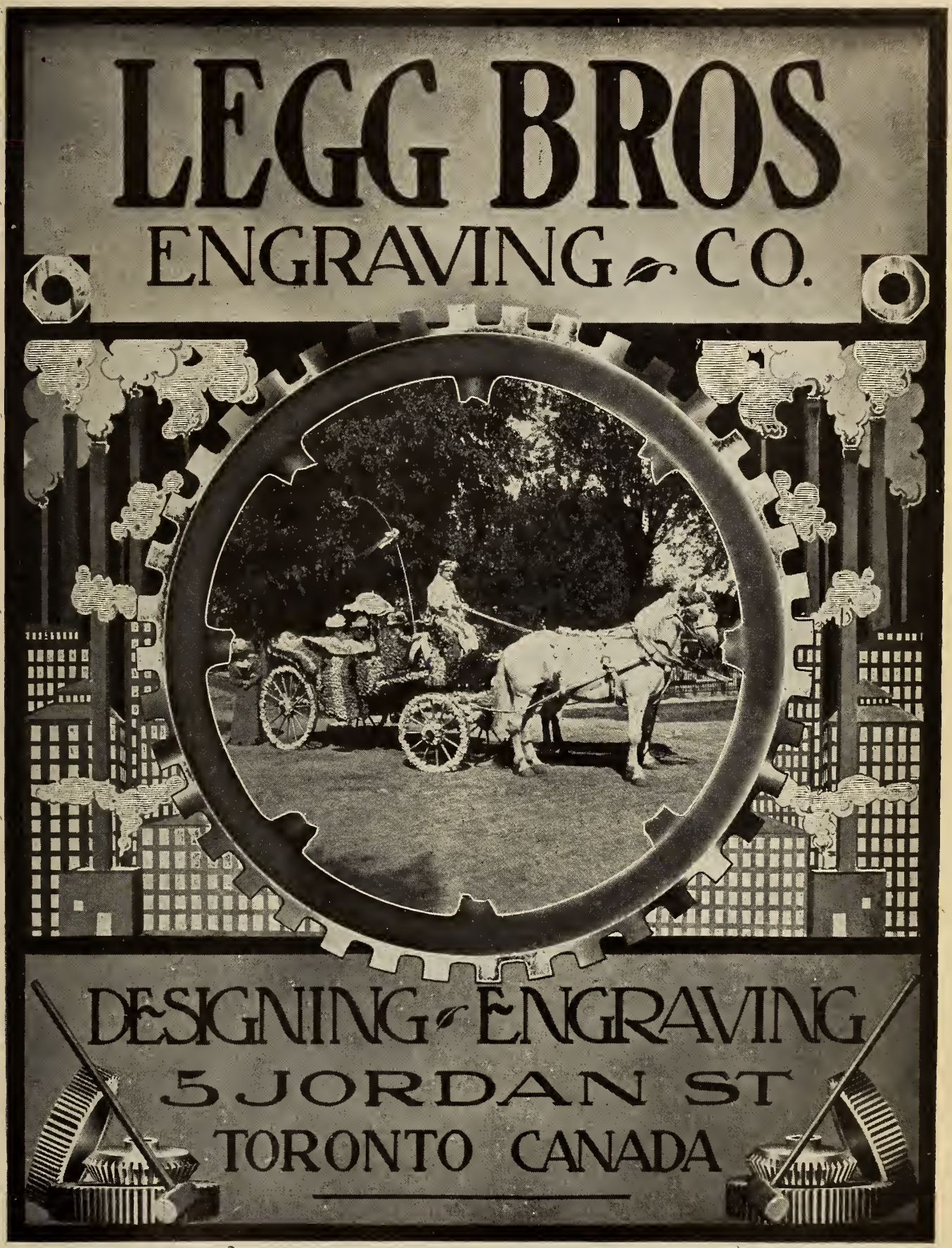
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Canada Foundry Co.

Boilers—
Canadian Rand Company Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Canada Foundry.
E. Leonard & Sons.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.

Bone Ash—
Lymans, Limited.

Briquetting Machinery—
American Grandal Co.
Mussens, Limited.

Buckets—
Peacock Bros.
Link Belt Co.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.

Building—Steel Frame—
Dominion Bridge Co.
Canada Foundry Co.

Cable—Aerial and Underground—
Standard Underground Cable Co. of Canada, Limited.

Cableways—
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.
Allis-Chalmers-Bullock, Ltd.

Cages—
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.

Cables—Wire—
Standard Underground Cable Co. of Canada, Ltd.

Cars—
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.

Castings—
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

Cement Machinery—
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

Cement Testing—
Campbell & Deyell.
Can. Laboratories.

Chain—
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.

Channelling Machines—
Jeffrey Mfg. Co.
Sullivan Machy. Co.
Canadian Rand Co.
Mussens, Limited.

Chemicals and Supplies—
Roessler & Hasslacher Chemical Co.
Lymans, Limited.

Chemists—
C. L. Constant & Co.
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

Classifiers—
Allis-Chalmers-Bullock.

Coal—
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Crushers—
Peacock Brothers.
Jeffrey Mfg. Co.

Coal Cutters—
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Canadian Rand Co.
Peacock Brothers.
Mussens, Limited.

Coal Handling Machinery—
Jeffrey Mfg. Co.
M. Beatty & Sons.

Coal Mining Explosives—
Curtis & Harvey.

Coal Mining Machinery—
Canadian Rand Co.
Peacock Brothers.
Jeffrey Mfg. Co.

Coal Punchers—
Sullivan Machinery Co.
Canadian Rand Co.

Coal Storage Plant Construction—
Jeffrey Mfg. Co.

Coal Tipples—
Jeffrey Mfg. Co.

Coal Washeries—
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

Colleges—
Michigan College of Mines.
Toronto University.
School of Mining, Kingston.

Compressors—Air—
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Canadian Rand.
Mussens, Limited.
Peacock Bros.
Laidlaw-Dunn-Gordon.
Canada Foundry Co., Ltd.
Walker Brothers.

Concentrators and Jigs—
American Grandal Co.
Duster Concentrator Co.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
Chalmers & Williams.

Concrete Mixers—
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

Condensers—
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

Converters—
Canadian Westinghouse.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

Conveyors—Belt—
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co .
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

Cranes—
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

Crane Ropes—
Allan, Whyte & Co.
Thos. & Wm. Smith.

Crushers—
Allis-Chalmers-Bullock Co.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
Waterous Engine Co.
Chalmers & Williams.

Cyanide Plants—
Allis-Chalmers-Bullock.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Chalmers & Williams.
Peacock Brothers.

Derricks—
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith & Travers, Drafting Materials.
John Davis & Sons.
A. L. Berger.
Peacock Bros.

Dredging Machinery—
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

Dredging Ropes—
Allan, Whyte & Co.

Driers—
Jeffrey Mfg. Co.
Mussens, Limited.

Drills, Air and Hammer—
Canadian Rand Co.
Mussens, Limited.
Jeffrey Mfg. Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

Drills—Core—
Canadian Rand Co.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

Drills—Diamond—
American Diamond Rock Drills.
Sullivan Machinery Co.

Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers. Dynamo Works, Ltd.

Drills—Submarine—
M. Beatty & Sons.
Canadian Rand Co.
Mussens, Limited.

Dumps—
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

Dynamite—
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

Dynamos—
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Jones & Moore Electric Co., Ltd.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Dynamometer—
Laurie & Lamb.

Ejectors—
Mussens, Limited.
Peacock Bros.

Elevators—
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian Iron Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

Elevator Buckets—
Mussens, Limited.

Engineering Instruments—
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

Engineers and Contractors—
Smart-Turner Machine Co.
Peacock Bros.
C. L. Constant & Co.

Engines—Automatic—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.

Engines—Gas and Gasoline—
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.

Engines—Haulage—
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

Engines—Oil—
Jenckes Machine Co.
Peacock Bros.

Engines—Steam—
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

Engines—Traction—
E. Leonard & Sons.
Jenckes Machine Co.

Excavators.
Jeffrey Mrg. Co.
Mussens, Limited.

Fans—Ventilating—
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

Feeders—Ore—
Smart-Turner Machine Co.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

Filters—
John McDougall Caledonian Iron Works,

Fire Extinguishers—
Mussens, Limited.

Forges—
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

Forgings—
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

Furnaces—Assay—
Lymans, Limited.
Mussens, Limited.

Fuse—
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

Gears—
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

Generators—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

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Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

Giants—Hydraulic—
Mussens, Limited.

Ground Detectors—
Canadian Westinghouse.

Galvanized Strand—
B. Greenings Wire Co., Ltd.

Girders—Steel—
Dominion Bridge Co.

Heaters—Feed Water—
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.

High Speed Steel Twist Drills—
Mussens, Limited.

Hoists—Air, Electric and Steam—
Canadian Rand Co.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.

Hoisting Engines—
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.
Sullivan Machinery Co.

Hoists—Gas and Gasoline—
Mussens, Limited.
Waterous Engine Works.

Hoisting Ropes—
Allan, Whyte & Co.

Hose—
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Rand, Ltd.
Can. Cleveland Drill Co.

Injectors—
Mussens, Limited.
Peacock Bros.

Jacks—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Jigs—
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Lamps—Acetylene—
Mussens, Limited.

Lamps—Arc—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Incandescent—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Safety—
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

Levels and Rules—
C. L. Berger & Co.
John Davis & Sons.
T. Eaton Co.

Lighting Systems—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Lights—Dump—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Lights—Mine Bldg—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Link Belt—
Watrous Engine Works.
Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse

Lubricators—
Peacock Brothers.

Metal—Bearing—
Canada Metal Co.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Mica Dealers—
Canada Metal Co.
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.

Monel Metal—
Orford Copper Co.

Motors—
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Nickel—
Can. Copper Co.

Ore Sacks—
Can. Bag Co.
Can. Fairbanks-Morse Co.

Ore Samplers—
Can. Laboratories.
Campbell & Deyell.

Ore Testing Works—
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

Ores and Metals—Buyers and Sellers of—
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Packing—
Mussens, Limited.

Paints and Oils—
Paterson Mfg. Co.

Perforated Metals—
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.

Pick Machines—
Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

Pipe Fittings—
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

Pipe Wood—
Peacock Brothers.

Pneumatic Tools.
Can. Cleveland Drill Co.
Canadian Rand Co.
Peacock Brothers.
Jones & Glassco.

Producer—Gas—
Mussens, Limited.
E. Leonard & Sons.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.

Pulleys, Shaftings and Hangings—
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.

Pielsometers—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Pulverizers—
Jeffrey Mfg. Co.

Pumps—Boiler Feed—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.

Pumps—Centrifugal—
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Canadian Rand Co.
Laurie & Lamb.

Pumps—Electric—
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.

Pumps—Pneumatic—
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.

Pumps—Rotary—
E. Leonard & Sons.

Pumps—Sinking—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.

Pumps—Steam—
Canadian Rand Co.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

Pumps—Turbine—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.

Pumps—Vacuum—
E. Leonard & Sons.
Smart-Turner Machine Co.

Quarrying Machinery—
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Canadian Rand Co.

Rammers—Sand—
Canadian Rand Co.

Rams—Hydraulic—
Mussens, Limited.

Receivers—Air—
Canadian Rand Co.
Sullivan Machinery Co.

Roasting Plants—
Allis-Chalmers-Bullock.

Rolling Mill Machinery—
Peacock Brothers.

Rolls—Crushing—
Mussens, Limited.

Roofing—
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Metallic Roofing.
Can. H. W. Johns-Manville Co.

Rope—Manilla and Jute—
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Rope—Wire—
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Samplers—
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

Scales—
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

Screens—
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.

Separators—
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

Separators—Magnetic—
American Grondal Co.
Wetherill Magnetic Separating Co.

Shoes and Dies—
Peacock Bros.

Shovels—Steam—
Mussens, Limited.
M. Beatty & Sons.

Slime Tables—
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

Smelting Machinery—
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.

Smelters & Refiners—
Consolidated Mining & Smelting Co.

Sprayers—
Mussens, Limited.

Stamp Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.

Steel Drill—
Sullivan Machinery Co.
Canadian Rand Co.
Peacock Bros.
Edgar Allen & Co.

Steel—Manganese—Castings—
Peacock Bros.
Hadfield's Steel Foundry Co.
Can. Steel Foundries.

Steel—Tool—
Canadian Steel Foundries.
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Edgar Allen & Co.
N. S. Steel & Coal Co.

Steel—Structural—
Dominion Bridge Co.

Stocks and Dies—
Mussens, Limited.

Surveying Instruments—
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

Switchboards—
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Brothers. Dynamo Works, Ltd.

Tanks—Cyanide, Etc.—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.

Tramways—
Mussens, Limited.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Transformers—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Brothers. Dynamo Works, Ltd.

Transits—
C. L. Berger & Sons.
T. Eaton Co.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

Tube Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.

Turbines—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Brothers. Dynamo Works, Ltd.
John McDougall Caledonian Iron Works, Ltd.

Typewriters—
Underwood Typewriter Co.

Vises—
Mussens, Limited.

Water Gauges—
John Davis & Sons.

Water Wheels—
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.

Wheels—
Mussens, Limited.
Jeffrey Mfg. Co.

Winding Engines—
Waterous Engine Works.
Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Canadian Rand Co.
E. Leonard & Sons.
Siemens Brothers. Dynamo Works, Ltd.

Wire Cloth—
Mussens, Limited.
B. Greening Wire Co.

Wire (Bare and Insulated, Trolley)—
Standard Underground Cable Co. of Canada, Ltd.

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Universal Locating Transit

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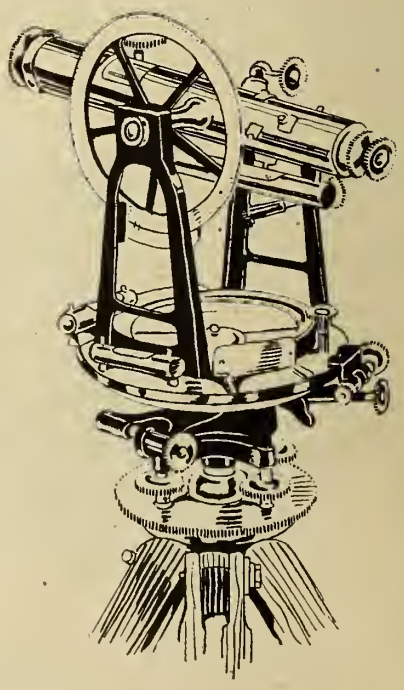

S4-35. Universal Locating Transit. Achromatic terrestrial telescope 9 inches long, objective glass, 1½-inch aperture with dust cap, sun shade and dust protector to object slide. Improved achromatic eye-piece with spiral motion for focusing cross-hairs. Stadia wires. Clamp and tangent screw to telescope with counter spring compass needle 3⅝-inch long. The compass is provided with variation plate set by capstan head pinion. Horizontal limb 5⅛-inch graduated to half degrees and reading to one minute by two opposite double verniers placed at an angle of 30° to line sight. The graduation has two rows of figures reading in opposite directions from zero to 360°. Two spirit levels to horizontal limb graduated on the glass. Clamp and tangent screw with opposing spring, long independent centre. Four leveling screws ⅝-inch shifting centre. Weight of instrument without tripod 9½ pounds. Instrument complete in mahogany box, plumb bob, reading glass, adjusting pins, etc., with either extension or split leg tripod.
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is not merely *one* sheet of water-proofed stone felt, but *several* layers cemented together with nature's wonderful water-proofer—Trinidad Lake Asphalt. This Asphalt is also hermetically sealed, making any escape of oils or asphalt impossible.

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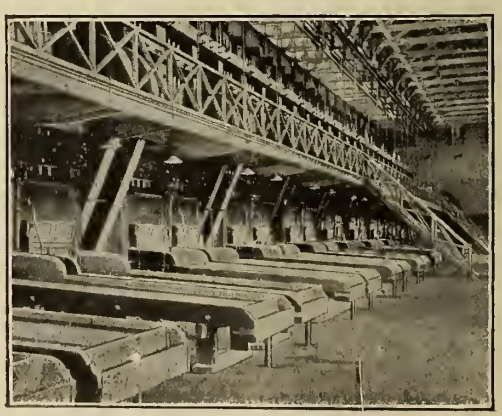

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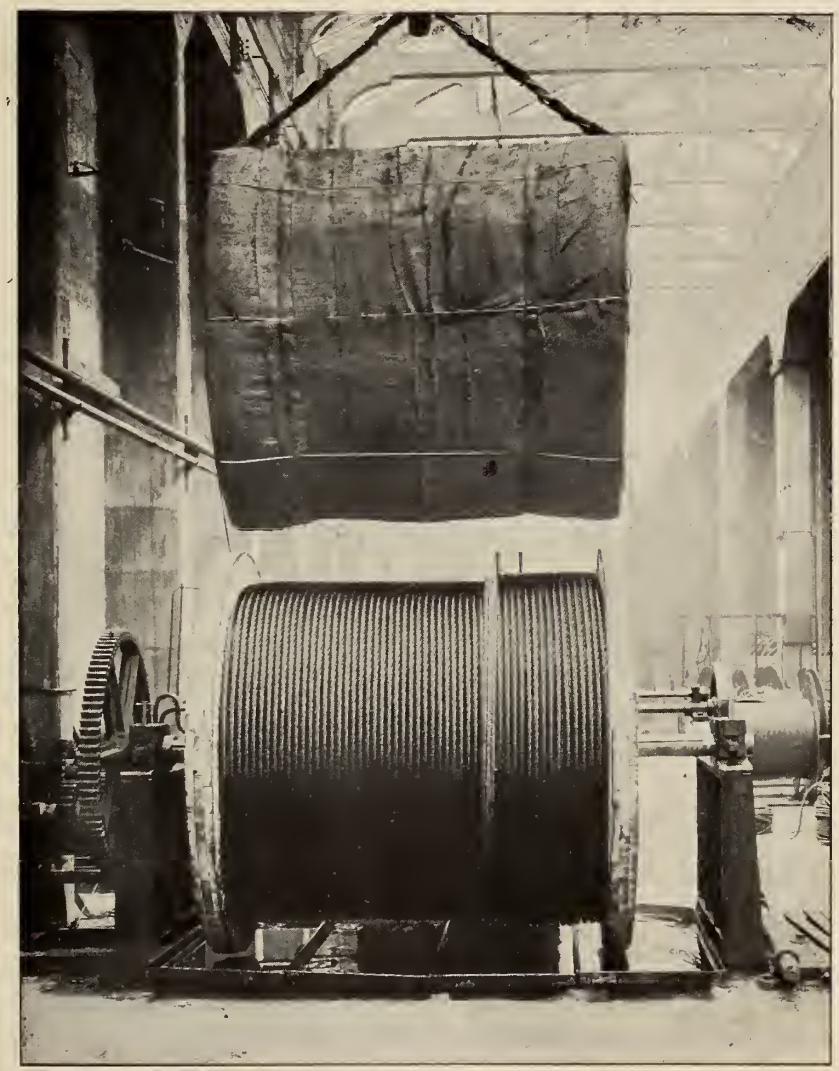

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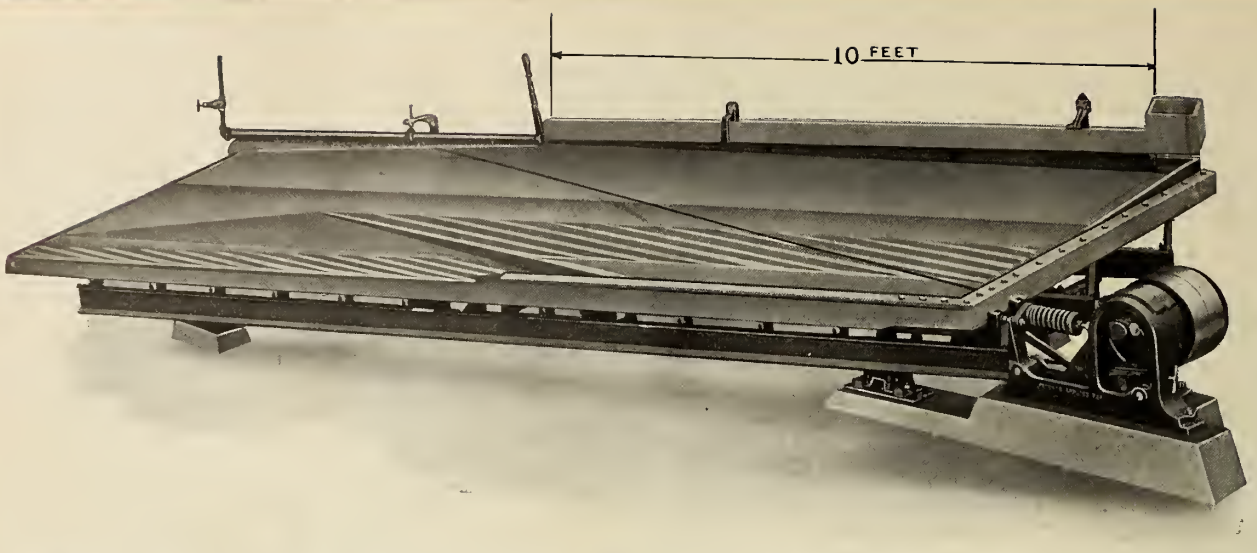

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